

guide  
to  
**CROP**  
**PROTECTION**  
in *Alberta*  
**1986**



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**PART 1**  
**CHEMICAL**

Herbicides   Fungicides   Insecticides

**Alberta**  
AGRICULTURE  
AGDEX 606-1

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# GUIDE TO CROP PROTECTION IN ALBERTA

1986

## PART I - CHEMICAL

*Edited by*  
**Shafeek Ali, P. Ag.**  
**Crop Protection Branch**  
**Alberta Agriculture**  
*in co-operation with*  
**The Agro-chemical Industry**

**Shafeek Ali**  
*Herbicides*

**Michael G. Dolinski**  
*Insecticides*

**Ieuan R. Evans**  
*Fungicides*

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## INSTRUCTIONS FOR USE OF GUIDE

This publication contains a set of foldout charts and descriptive text which must be used as a unit. When using, go through the following steps:

1. Identify the pests.
2. Refer to the appropriate foldout chart for the crop.
3. Record the pesticide(s) available from the chart.
4. Look up the pesticide(s) in the text and note characteristics, safety, method of application, effect on pest and crop, etc.
5. Select the product best suited to your need.
6. Apply according to instructions given on the label.

## HERBICIDE PERFORMANCE RATINGS

### Tolerance of Crop to Herbicides

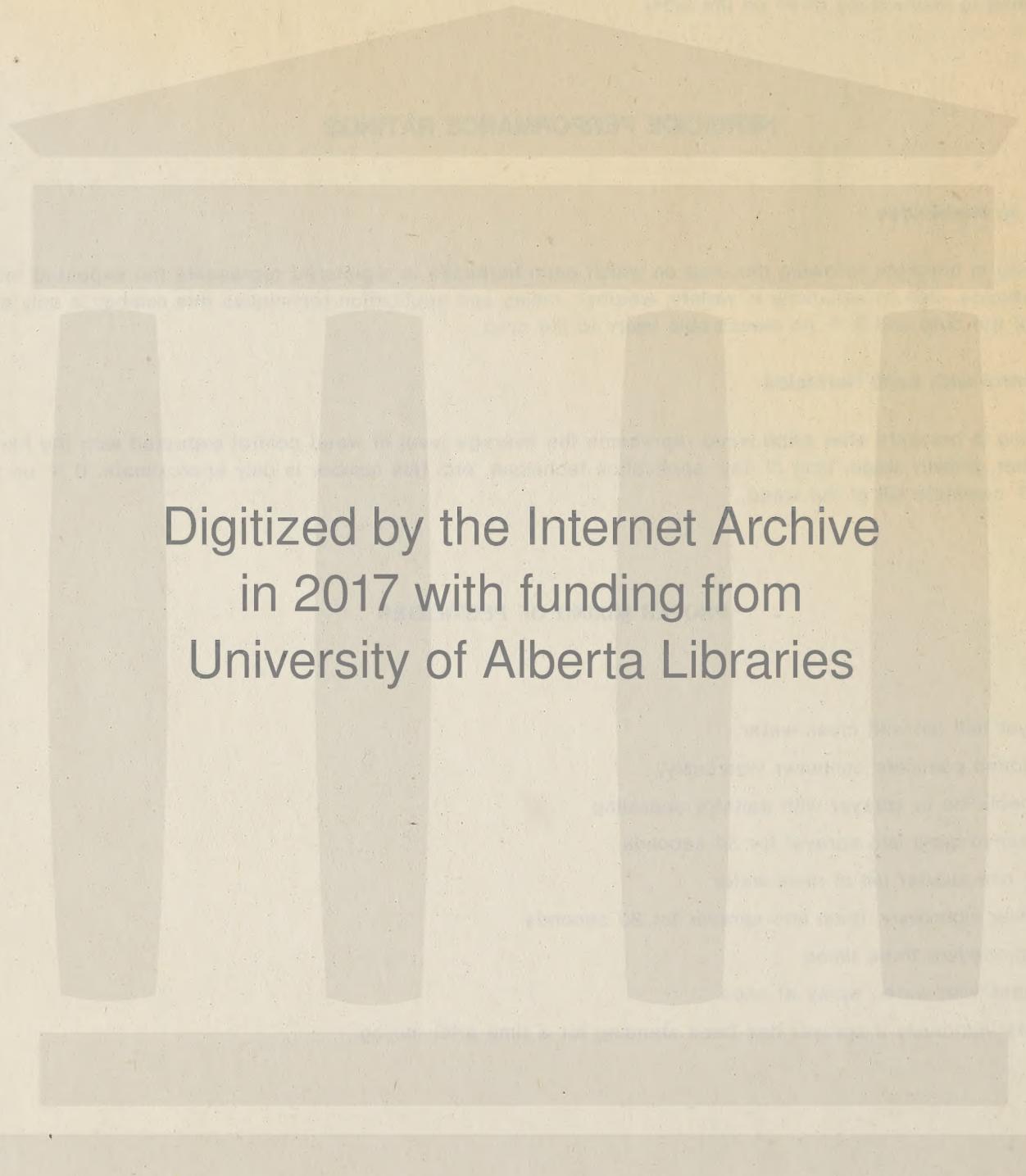
The number appearing in brackets following the crop on which each herbicide is registered represents the expected tolerance of the crop to that herbicide. Due to variations in variety, weather, timing and application techniques this number is only approximate. 0 = complete kill of the crop and 9 = no measurable injury to the crop.

### Level of Weed Control with each Herbicide

The number appearing in brackets after each weed represents the average level of weed control expected with the herbicide. Due to variation in weather, growth stage, time of day, application technique, etc. this number is only approximate. 0 = no control of the weed and 9.0 = complete kill of the weed.

## PROPER MIXING OF PESTICIDES

1. Fill the sprayer half full with clean water.
2. Shake the closed pesticide container vigorously.
3. Slowly add pesticide to sprayer with agitator operating.
4. Allow container to drain into sprayer for 30 seconds.
5. Fill container one quarter full of rinse water.
6. Shake container vigorously, drain into sprayer for 30 seconds.
7. Repeat this procedure three times.
8. Fill sprayer tank with water, spray at once.
9. Always agitate vigorously if sprayer has been standing for a time after mixing.



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## ADDRESSES AND TELEPHONE NUMBERS - CHEMICAL COMPANIES

**BASF Canada Inc.**  
10 Constellation Court  
Rexdale, ON M9W 1K1  
(416)675-3611

**Chemagro Ltd.**  
2381 Ness Avenue  
Winnipeg, MAN R3J 1A5  
(204)885-1661

**Chipman Inc.**  
P.O. Box 965  
Winnipeg, MB R3C 2V5  
(204)786-3421

**Ciba Geigy Canada Ltd.**  
820 - 26 Street N.E.  
Calgary, AB T2A 2M4  
(403)273-5656

**Cyanamid of Canada Ltd.**  
712H 6 Street S.E.  
Calgary, AB T2H 2M8  
(403)253-0924

**Dow Chemical Canada Ltd.**  
2403 - 10104 103 Avenue  
Edmonton, AB T5J 0H8  
(403)428-0442  
Toll Free: 1-800-661-6436

**DuPont Canada Inc.**  
#105, 333 - 25 Street E.  
Saskatoon, SK S7K 0L4  
(306)244-4511

**Elanco Products Division**  
**Eli Lilly Canada Inc.**  
9635 - 45 Avenue  
Edmonton, AB T6E 5Z8  
(403)436-6131

**Hoechst Canada Inc.**  
295 Henderson Drive  
Regina, SK S4N 6C2  
(306)924-1500

**Interprovincial Co-op Ltd.**  
Box 1050  
Saskatoon, SK S7K 3M9  
(306)244-3208

**Later Chemicals Ltd.**  
2239 - 14A Street S.E.  
Calgary, AB T2G 3L1  
(403)265-3501

**May and Baker Canada Inc.**  
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Winnipeg, MB R3H 0E4  
(204)774-1819

**Monsanto Canada Inc.**  
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Winnipeg, MB R3J 3E2  
(204)885-6740

**MSD Ag Vet**  
Division of Merck Frosst Canada Ltd.  
P.O. Box 1005, Pointe Clair  
Dorval, PQ H9R 4P8

**Pfizer Chemicals and Genetics Inc.**  
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1 Wilton Grove Road  
London, ON N6A 4C6  
(519)681-2173

**Rohm and Haas Canada Ltd.**  
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Winnipeg, MB R3H 0P5  
(204)774-1755

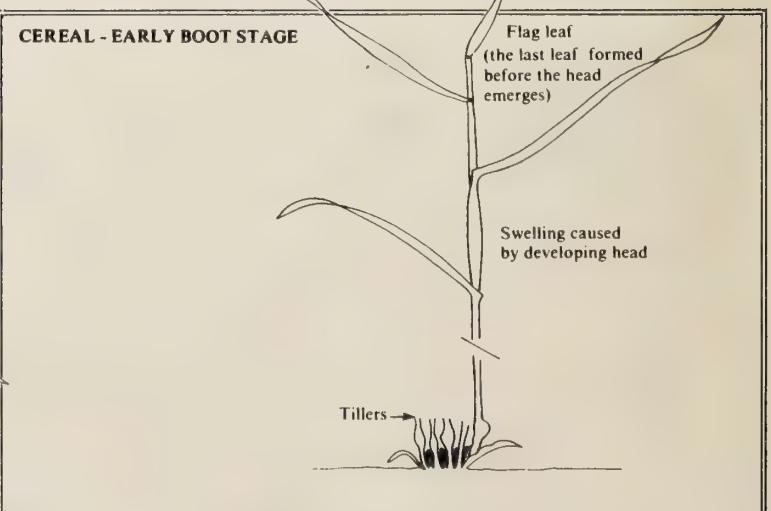
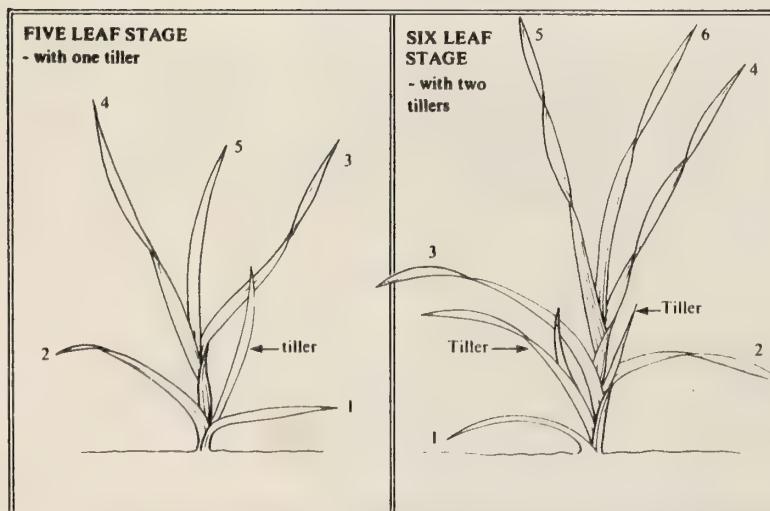
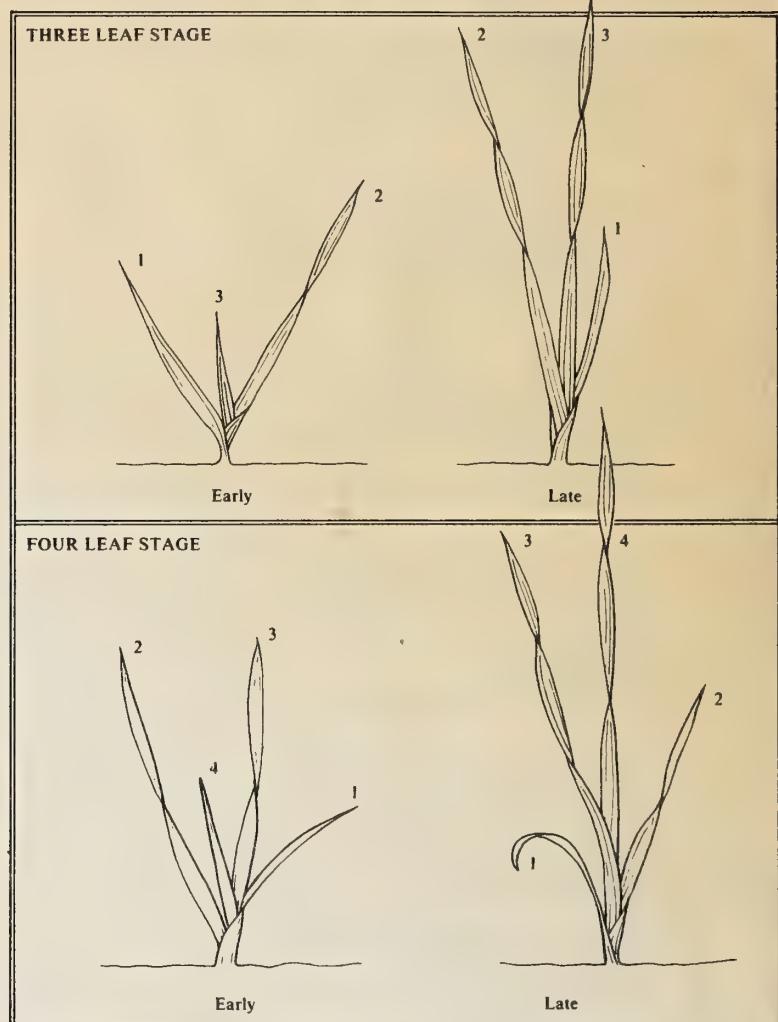
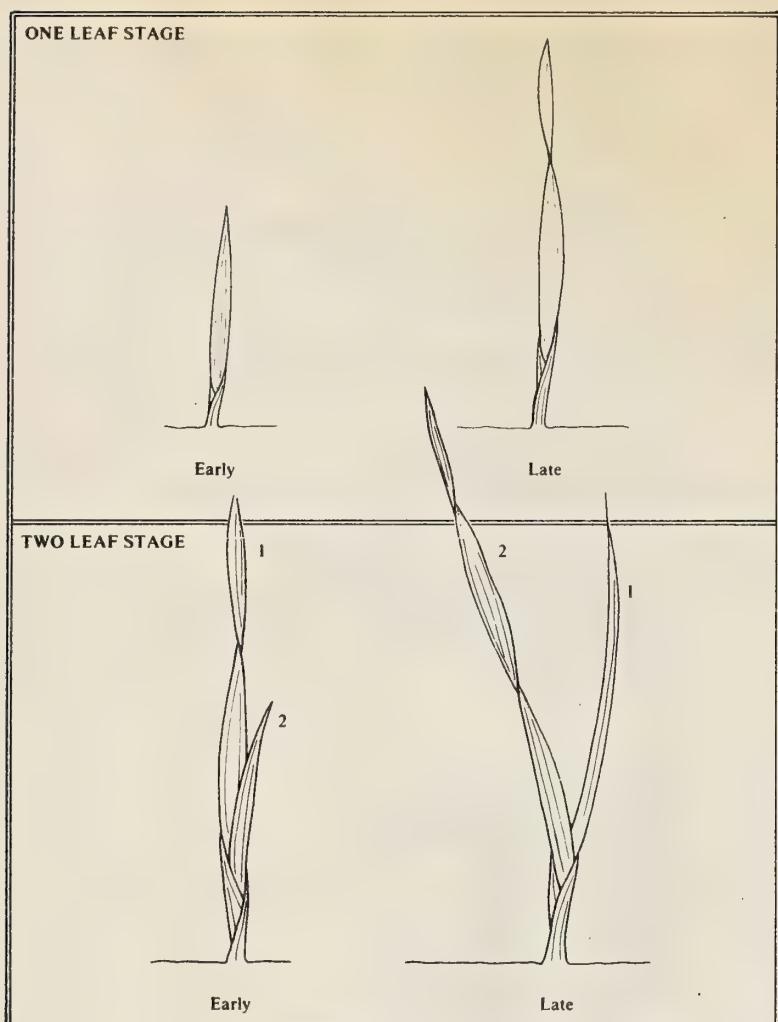
**Sanex Inc.**  
9577 - 60 Avenue  
Edmonton, AB T6E 0C1  
(403)438-1928

**Union Carbide**  
5507 First Street S.E.  
Calgary, AB T2H 1H9  
(403)253-8471

**Uniroyal Chemicals**  
4, 1323 - 44 Avenue N.E.  
Calgary, AB T2E 6L5  
(403)276-9481

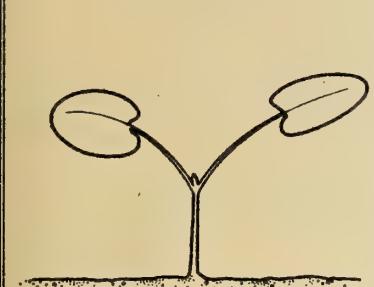
**Velsicol Canada Inc.**  
Suite 302 Plaza 4  
2000 Argentia Road  
Mississauga, ON L5N 1W1  
(416)821-7850

# LEAF STAGES — CEREALS and GRASSES

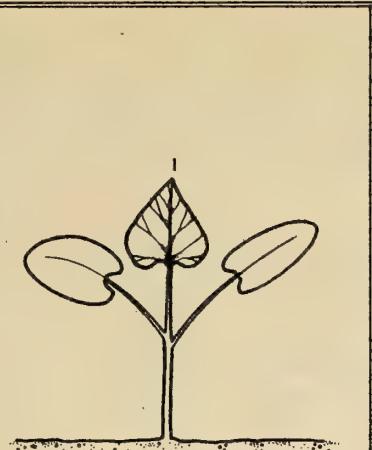


# LEAF STAGES — BROADLEAVED WEEDS

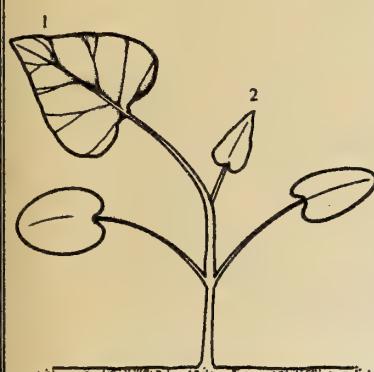
ALTERNATE LEAVES



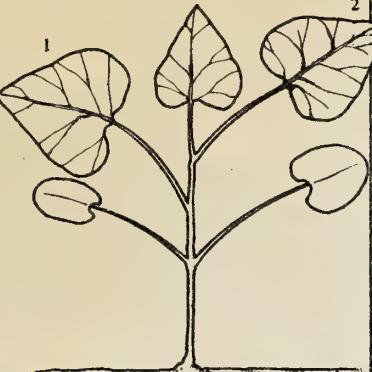
Cotyledon Stage



One Leaf Stage

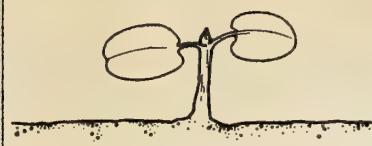


Two Leaf Stage



Three Leaf Stage

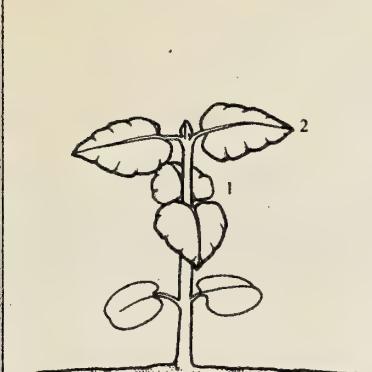
OPPOSITE LEAVES



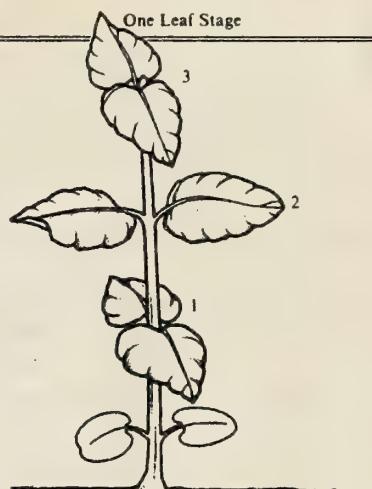
Cotyledon Stage



One Leaf Stage

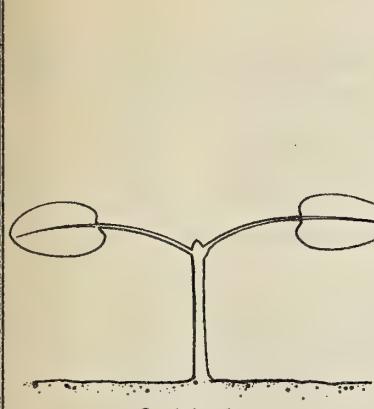


Two Leaf Stage

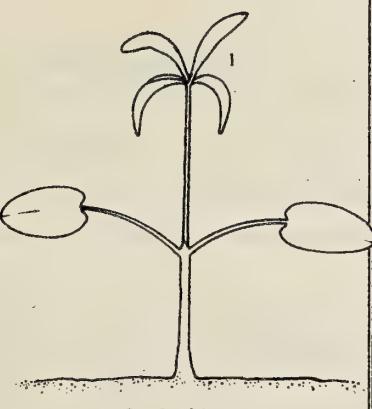


Three Leaf Stage

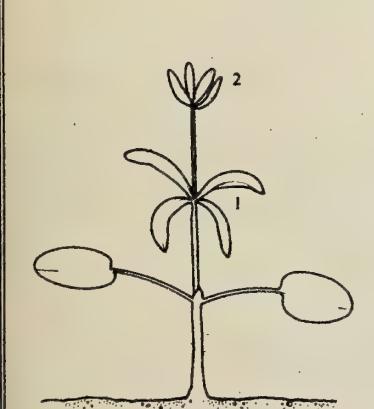
WHORLED LEAVES



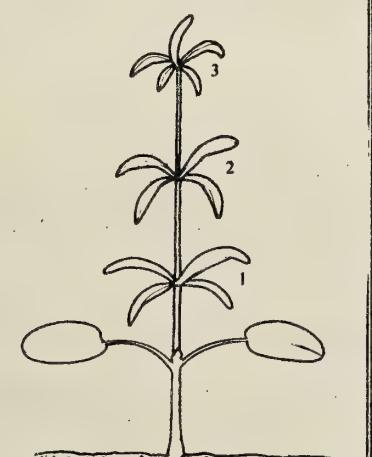
Cotyledon Stage



One Leaf Stage



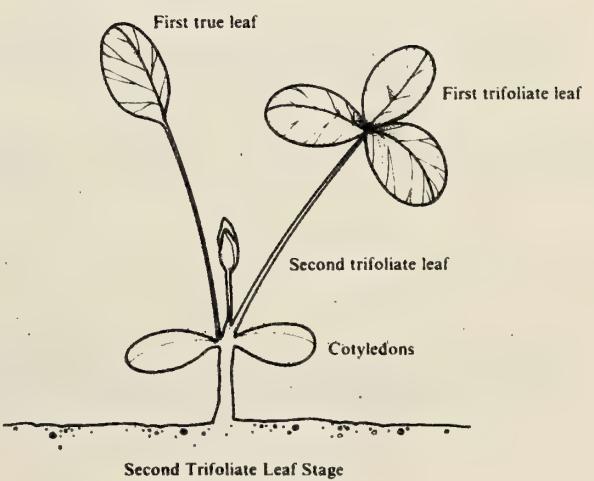
Two Leaf Stage



Three Leaf Stage

## LEAF STAGES — LEGUME CROPS

ALFALFA and CLOVERS



Second Trifoliate Leaf Stage



# CHEMICAL PEST CONTROL IN ALBERTA

## INTRODUCTION

This guide is to assist farmers to select and apply pesticides. Pesticides should be used in a management system including crops adapted to local climate and soil type. Use resistant varieties where available. Plant clean, disease free seed. A good seed bed and banded fertilizer give crops a head start on weeds. Use crop rotations, good sanitation and take care to prevent pests from overwintering. Destroy infestations at their source. Compared to the cost of pesticides these controls are cheap. Consider not only price and efficacy but also toxicity and persistence when choosing pesticides.

## IDENTIFY THE PROBLEM EARLY

Often pest control occurs on an emergency basis but cheaper, more effective controls may be available if the problem is anticipated or detected early. Check fields often and anticipate problems, based on last year's situation.

**AVOID UNSATISFACTORY RESULTS** - (a) Crop damage or (b) Inadequate control. Years of testing precede a pesticide registration and result in explicit instructions on the label. Most failures happen when the farmer does not completely follow these directions.

## COMMON REASONS FOR PESTICIDE FAILURE

1. Improper application
  - **Failure to apply the recommended amount.** Where rate ranges are given, the minimum is for light infestations using good sprayers and techniques. Growing conditions have to be good and crop competition normal. For less favourable conditions or high pest populations use the high rate. Heavy textured and high organic soils require higher rates of soil applied herbicides.
  - **Poor equipment.** Applications made with worn nozzles, loose hitches, low pressure or inadequate water volumes result in less control and possible crop damage.
  - **Failure to incorporate soil-applied herbicides** soon enough or thoroughly enough may result in loss of activity due to evaporation or ultraviolet breakdown. Follow label instructions carefully and ensure soil is properly prepared.
  - **Use of water with suspended silt**, a high pH or high mineral content may reduce effectiveness.
  - **Poor application technique** such as incorrect boom height, incorrect nozzles or pressure, plugged filters or excessive speed for the terrain all contribute to poor results.
2. Bad Timing
  - Each pest has a most susceptible and each crop a most tolerant stage. A common problem is treating too late, after the pests develop resistance. A rule of thumb is treat early within the proper stage.
3. Selection of the wrong material
  - Farmers rarely use a totally unsuitable pesticide but often several pesticides are available and they may not pick the best one available. Some of the weeds are controlled but better selection could control more species at no more cost. For best results examine the field and identify all of the weeds before making a selection.

## WHAT TO DO IF RESULTS ARE UNSATISFACTORY

1. Compare your procedures, with the label instructions.
2. Check for plugged screens, nozzles worn or mixed by type or size.
3. Check calibration, work back from acres and amount of chemical.
4. Consider time since application. Some results are not apparent for several days. Look for early symptoms of the chemical taking effect.
5. If there are no results after a week seek technical help. Gather all relevant data, particularly evidence such as photos or dried specimens. Record wind, rainfall, soil moisture condition, crop variety, fertility and temperature at time of spraying, quantity of material used and acres treated.
6. Document everything in writing. If crop damage is involved submit a specimen for diagnosis. Disease or insect damage can resemble herbicide injury.

## CHEMICAL MIXTURES

Many pesticides are tank mixed to extend the range of control or the timing. A mixture of two or more pesticides may prove synergistic. Some mixtures simply act as if the components were applied separately. In other mixtures the activity of one or both chemicals is reduced. Many mixtures have not been tested. For these reasons use only registered mixes.

## ADJUVANTS (SURFACTANTS, WETTING AGENTS, SPREADERS, ETC.)

Adjuvants are compounds added to a pesticide to enhance application and/or performance. Pesticides are generally formulated

with the proper amount of adjuvant and additional quantities are not usually required. If adjuvants are considered, USE ONLY THOSE PRODUCTS NAMED AND RECOMMENDED ON THE LABEL. Failure to do so could result in: (a) Crop injury, (b) Reduced control, (c) Chemical residue in the crop, (d) Invalidation of pesticide warranty.

## PESTICIDE SAFETY

### 1. LETHAL DOSE (LD<sub>50</sub>)

The LD<sub>50</sub> of a pesticide is the single dose that kills 50% of a group of animals which are given the chemical by mouth (orally). It is measured as the amount, in milligrams, of chemical given per kilogram of body weight of the animal (mg/kg). THE LOWER THE LD<sub>50</sub>, THE MORE DANGEROUS IS THE PESTICIDE.

The following table relates the oral LD<sub>50</sub> (mg/kg) of a pesticide to its toxicity.

less than 50 high toxicity	500-1000 moderate toxicity	1000-2500 low toxicity	greater than 2500 very low toxicity
			

DANGER POISON

WARNING POISON

CAUTION POISON

### 2. HUMAN EXPOSURE TO PESTICIDES

Farmers may be exposed to pesticides when they are (a) handling and mixing powders, dusts and granules; (b) opening containers of emulsifiable concentrates (E.C.); (c) pouring concentrated liquids into the sprayer tank; and (d) spraying.

Pesticides may enter the body through the skin (dermally) and mouth (orally), and by inhalation. Penetration through the skin is the most common way and occurs when the concentrated chemical is being handled, or the dilute material is being sprayed without proper safety clothing. Immediate illness may occur once enough chemical enters the body. Although many pesticides do not penetrate the skin, they may still cause skin problems such as redness, blisters, or dry scaliness that may lead to serious skin eczema and dermatitis. Pesticides may enter the body through cuts, scrapes and bruises which should be covered with band-aids or bandages. Eyes are very sensitive to pesticides. They can be exposed to vapour or fumes, spray drift, or accidental spills and splashes when containers of liquid concentrates are being opened or when the concentrated chemical is being poured into the sprayer tank.

Pesticides can enter through the mouth when a farmer eats or smokes with contaminated hands or when he licks his lips. Children may be poisoned if they drink pesticides stored in pop bottles. All pesticides should be stored in their original containers in a securely locked area out of reach of children.

Pesticides can also enter the body through the inhalation of fumes, dusts, or spray mists. In the case of fumes and extremely fine particles of dust or spray, complete absorption of chemical by the lungs can occur and the hazard is high.

### 3. STANDARD SAFETY PRECAUTIONS

Whenever working with pesticides, wear standard protective clothing: long sleeve shirt, full length pants, coveralls, rubber boots, and cap.

In addition to the standard clothing, use common sense to decide what extra protection is needed for a particular job. Sometimes the label on the pesticide container gives details of extra precautions required. Extra protective equipment is rubber or neoprene gloves, goggles, respirators, and gas masks.

- a. **Coveralls:** Two types of coveralls are available: reusable and disposable. Reusable cotton coveralls are washable and can be used again and again. Disposable paper coveralls are usually more comfortable in hot weather and are lightweight. If they become damaged or severely contaminated, they should be discarded. Wash coveralls after every pesticide application or when contaminated.
- b. **Rubber boots:** Do not wear leather boots and sneakers as they absorb pesticides and are difficult to clean. The legs from the coveralls should be outside the top of the boots to prevent spills and splashes from running into the boots. If the inside of the boots is contaminated, it should be washed out immediately.
- c. **Caps:** Prevent powders, dusts, or spray mists being deposited on the hair or scalp and be absorbed into the body.
- d. **Gloves:** These are required when handling, mixing, or pouring concentrated pesticides. Rubber or neoprene are recommended but they should be washed very soon after use as the chemical may penetrate into the material. Do not wear leather or cloth gloves. These materials soak up the chemical and become a source of continuous contamination. Gloves with holes should not be worn. The sleeves of the coveralls should be worn outside the gloves to prevent spills and splashes from running into the gloves.

- e. **Goggles:** Eyes should be protected with goggles, which are resistant to chemicals and have ventilation to prevent fogging.
- f. **Respirators:** PERMANENT RESPIRATORS have one or two cartridges screwed on to a facepiece. Each cartridge contains a prefilter which removes dust particles and a filter of activated charcoal which absorbs the chemical. The cartridges are unscrewed and discarded as soon as any odour of the pesticide is detected in the facepiece. Permanent respirators are cleaned after each day's use: unscrew the cartridges and wash the facepiece with soap and water. Rinse the facepiece in clean water, dry with a clean cloth, and screw on the cartridges. The clean respirator should be stored in a sealed plastic bag to prevent cartridges from absorbing air borne contaminants. DISPOSABLE RESPIRATORS have the prefilter and filter in one cartridge that is permanently attached to the facepiece. The entire respirator is discarded when any odour is detected in the facepiece. These respirators should also be stored in a sealed plastic bag. **SPECIAL NOTE:** Farmers should buy respirators and cartridges approved for use with pesticides. Gauze and dust masks are not respirators and are not recommended for pesticide dusts.
- g. **Gas Mask:** These are used when a farmer is likely to be exposed to very high levels of pesticides. The facepiece covers the eyes, nose and mouth. It is connected by a flexible hose to a charcoal canister worn on the belt. The lifespan of this canister is longer than that of the respirator cartridges. Manufacturer's directions are to be followed for cleaning and storing gas masks and canisters.

#### 4. SAFETY EQUIPMENT STORES

Safety clothing and equipment are sold by Alberta Wheat Pool, Cargill Grain, U.F.A. Coop, Fleck Bros., Levitt Safety, and Safety Supply.

#### 5. POISON INFORMATION CENTRES

The emergency department of most hospitals can deal with pesticide poisoning. However, there are three hospitals within the province with additional information on pesticide poisoning.

University of Alberta Hospital 83 Avenue & 112 Street Edmonton, Alberta General Information: 432-8822	Calgary General Hospital 841-Centre Avenue E. Poison Control Centre: 262-5982 EMERGENCY Department: 268-9625	Foothills Hospitals 1403-29 Street N.W. Calgary, Alberta EMERGENCY Department: 270-1315	
Some manufacturers have emergency telephone numbers to call in case of pesticide poisoning.			
Chipman Incorporated Tel: 1-416-528-6771 1-416-643-4123	Monsanto Canada Inc. Tel: 1-314-694-1000	Cyanamid Canada Inc. Tel: 1-416-356-8310	Union Carbide Tel: 1-514-645-5311

#### 6. STANDARD FIRST AID MEASURES

Before using a pesticide, look for the hazard symbol on the label. This indicates the toxicity of the pesticide. If you are severely exposed to a pesticide and you are alone, DO NOT PANIC. The symptoms of the pesticide do not show up immediately. You will have some time to decontaminate yourself. Get any spilled pesticide off your body immediately. If the pesticide is on your clothes, remove them and rinse your skin with water. After rinsing, wash the area with soap and water. If you splash or spill pesticide in your eyes, wash eyes with water at once. Hold the eyelids open and wash eyes for at least 15 minutes with fresh water each time. Get help to take you to the emergency department of the nearest hospital and take the labelled container with you. Do not use any eye medication unless prescribed by a doctor.

Accidentally swallowing - read the label under FIRST AID INSTRUCTIONS to determine whether or not to induce vomiting. Usually if the formulation contains PETROLEUM DISTILLATES, vomiting should NOT be induced. If the label recommends vomiting, do so at once. Induce vomiting by drinking 1 or 2 glasses of water then sticking finger down throat OR swallowing syrup of ipecac (adult doses 30 mL; children under 12 years, 15 mL) followed by water to enhance vomiting. Do not induce vomiting in an unconscious or convulsive person. The person could choke to death on the vomit fluid. Get to the nearest hospital as soon as possible.

#### 7. OTHER PRECAUTIONS AND SAFETY TIPS

- a. Bees may be affected by pesticides or honey may be contaminated. Avoid spraying near hives or contaminating puddles of water from which bees may drink. Spray early in morning or late in afternoon when bee activity is at minimum. Warn beekeepers of your intentions so they can confine the bees or move them until spraying is over.
- b. Make sure herbicide containers are completely empty when you are finished. Rinse the container with water 3 times and adding the wash water to sprayer tank. The container is virtually clean and may be disposed of at an approved pesticide container collection site. Consult your local district agriculturist if a collection site does not exist in your area. Never reuse the container for other purposes.
- c. Control systems using electrically operated solenoid valves are available. These allow sprayers to be controlled remotely, preferably from within a cab. Cabs provide some protection against spray drift and a good tight cab with filtered air intake should reduce but not eliminate operator exposure.

## PLANT GROWTH REGULATORS (PGR'S)

Plant Growth Regulators (PGR's) are chemicals which affect the normal growth process of plants. Unlike herbicides, they are generally used on crop plants for beneficial effects such as increased yield, promotion of flowering, reduction in lodging, etc. At present, Cerone is the only PGR registered for use in Alberta.

### SOIL STERILANTS

Soil sterilants are growth preventers. They are poor killers of older weeds; they should be applied in the spring before growth begins or in the fall after growth ceases (before ground freezes). If application is made to established growth use a top kill material with the sterilant.

**Water volume** required for application of the soil sterilants is not critical, but even distribution over the ground surface is. Depending upon equipment used and foliage density this may vary between 100 and 1000 L/ac.

Soil sterilants are generally sold as wettable powders. Continuous gentle agitation is required to prevent settling out - heavy agitation will cause foaming and application problems. Make a slurry of the chemical in a separate container - fill the sprayer tank one half full of water - and while filling the tank with water and with the agitator operating pour the slurry into the tank. The agitator should not be stopped until the tank is empty. If by-pass agitation is used ensure the line enters the bottom of tank to minimize foaming.

All screens and filters throughout the spraying system should be no finer than 50 mesh. Never use felt filters.

After using soil sterilants the equipment should be thoroughly washed, and rinse water disposal on the treated site.

Most sterilants are relatively insoluble and become attached to soil particles - however heavy rainfall may cause physical movement of both chemical and soil particles and if the slope is steep movement will be substantial. Remember that after use of these products there will be no plant growth to slow erosion.

Bare ground will be maintained for 12-14 months after application. After this time chemical will have moved out of the top 2-3 cm of the soil surface and shallow rooted annual weeds and grasses will germinate. As they develop and send roots deeper into the chemical layer they will die, however there will always be new seeds germinating. By 24 months after application the "clean" layer of soil may be 6-8 cm deep and weed growth will be more obvious. At this time it may be necessary to apply a lower, reinforcing treatment of the soil sterilant.

Each product will leave a group of plants which are slightly tolerant. If more than two successive applications are made results will appear quite unsuccessful as these tolerant plants will predominate. The solution is to rotate products.

### NITRATE POISONING DUE TO HERBICIDE ACTION

Nitrates are the major form in which plants take up nitrogen to be used by the plant for making protein and other nitrogen compounds that are important for plant life and growth. In normal circumstances nitrates are converted to these other products at about the same rate that they enter the plant. Under some conditions nitrates accumulate because they are entering the plant faster than they can be converted. Nitrates combine with blood hemoglobin reducing oxygen utilization. The poisoned animal can die from suffocation.

Nitrate accumulations may be due to leaf damage due to frost, hail or herbicide action. After severe frost, hail or herbicide damage the nutrient value of the crop will decrease rapidly. From a feed value point of view it is important to harvest as soon as practical - however in the case of herbicide treated crops there may be a waiting period specified on the label and in the case of high risk crops, such as oats or corn a delay may be advisable to permit nitrate levels to decrease.

If there is a possibility of high nitrates in a feed, have it analysed at a feed testing laboratory. A veterinarian should be called immediately if livestock are showing unusual symptoms when they are being fed forages containing nitrates. Symptoms of nitrate poisoning include reduced milk production and growth rate, abortions and in severe cases death by suffocation.

### SPRAYER CALIBRATION

Sprayer calibration consists of adjusting speed, pressure and nozzles to produce the desired spray volumes. Pick the spray volume desired, mix the chemical and water to the correct strength and operate the sprayer at the speed and pressure that will provide the correct application rate.

Spray volume, pressure and nozzle spacing are all standardized for each chemical and nozzle type.

All that remains for the operator to do is to select the nozzle tip that provides the desired spray volume at a convenient speed; or to pick the correct speed (if nozzles are already determined) and to mix the chemical accordingly.

This system of calibration requires that the sprayer is in good working order, that the nozzles are not worn out and that the gauge provides a true reading of pressure at the nozzle.

The spray pattern must be uniform along the entire boom. To achieve a uniform pattern there are several conditions that must occur simultaneously:

1. Pressure must be set correctly.
2. Spray patterns from each nozzle must not be streaky.
3. Output from all nozzles must be equal.
4. Distance of nozzle tip from target must be correct.

The following steps are suggested to ensure that the sprayer is in good working order so that correct calibration can be achieved.

1. Remove and clean nozzles, screens and filters.
2. Check that nozzles are all the same size and spray angle.
3. Flush the entire system and install filters, screens and nozzles.
4. Check boom pressure with an accurate gauge and compare to sprayer gauge (they should be identical). If boom gauge reads lower, check for a flow restriction.
5. With pressure set at 275 kPa, clean or replace streaking nozzles then collect spray from each nozzle and compare to manufacturers specifications. Replace nozzles that vary by more than 5% of specifications. (nozzle chart in this section)

**NOTE: If ball check valves are being used an extra 35 kPa pressure is required to account for flow restriction. Diaphragm check valves do not require extra pressure.**

Once it has been established that the sprayer is operating correctly the spray volume can be determined from the nozzle chart. The spray volume is controlled by varying forward speed. **Do not change pressure setting.**

Example: If a sprayer is equipped with nozzle tips other than the STANDARD tips and the nozzle chart does not indicate at which speed that nozzle will provide 40 L/ac it will then be necessary to establish that speed.

eg. (from chart)

Nozzle No. 80015 provides 46 L/ac at 275 kPa and 6 km/h. To find which speed will provide 40 L/ac multiply: known L/ac x known speed, then divide by required L/ac

46 L/ac x 6 km/h = 276, then divide by 40 L/ac = 6.9 km/h.

#### SAMPLE NOZZLE CHART

Nozzle Type		Pressure kPa	Output per Minute Litres	Litres per Acre 50 cm spacing			
Teejet	Delavan			6 km/h	8 km/h	9 km/h	10 km/h
8001	LF 1-80	275	0.37	30	23	20	18
80015	LF 1.5-80	275	0.56	46	34	31	28
8002*	LF 2-80	275	0.75	61	46	40	36

\*STANDARD Tips for 40 L/ac at 275 kpa and 9 km/h.

Following is an example of how a sprayer can be calibrated.

#### SPRAYER CALIBRATION GUIDE

Litres Per Acre (L/ac)

#### EXAMPLE

50 Acres

1800 Litres

40 Litres per acre

8002 = 40 L/ac at 275 kPa and 9 km/h

50 ac x 40 L/ac = 2000 L

**NOTE: SPRAY TANK HOLDS 1800 LITRES. AT 40 L/ac, ONE FULL TANK COVERS 45 ACRES. A SECOND TANK WITH 200 L OF TOTAL SOLUTION IS NEEDED TO FINISH THE LAST 5 ACRES.**

Example: label states 0.6 L/ac

0.6 L/ac x 45 ac = 27 L in full tank;

0.6 L/ac x 5 ac = 3 L in second tank

Step 6 Amount of chemical to add:  
(rate per acre x no. of acres)

#### GROUND SPEED CHART

Speed km/h	Time to Travel 0.8 km (0.5 mi)		Speed km/h	Time to Travel 0.8 km (0.5 mi)	
	Minutes	Seconds		Minutes	Seconds
6.0	8	0	8.5	5	38
6.5	7	22	9.0	5	20
7.0	6	52	9.5	5	3
7.5	6	24	10.0	4	48
8.0	6	0			

**NOTE: Speed check should be done on a soil surface similar to that which will be sprayed. For nozzles or speeds not included refer to manufacturer's data or Guide To Crop Protection In Alberta Part III - Pesticide Application Equipment.**

If spray charts are not available for your nozzles the following formula may be used to establish their spray volume at a set pressure and speed.

$$\frac{24,282 \times \text{L/minute (one nozzle)}}{\text{km/h} \times \text{nozzle spacing (cm)}} = \text{L/ac}$$

First:

1. Adjust pressure to recommended setting (label).
2. Measure output of one nozzle (all nozzles must be equal).
3. Establish ground speed you will use.
4. Measure nozzle spacing (usually 50 cm).

Then use the above formula.

Example: 8002 nozzle at 275 kPa has an output of 0.75 L/minute and will apply 40 L/ac at 9 km/h (from chart).

$$\frac{24,282 \times .75 \text{ L/minute}}{9 \text{ km/h} \times 50 \text{ cm spacing}} = 40 \text{ L/ac}$$

## AIRCRAFT APPLICATION

Aircraft applicators must take care to get even distribution of pesticides, and avoid damage to crops. The following suggestions are offered to help minimize these hazards.

- a. To get best coverage of crops and minimize the loss of spray to the atmosphere, spray in winds under 15 km/h. For best results apply herbicides in volumes not less than 14 L/ac. Fly as low as is safe. Width of swath should not be more than 1.25 of wingspan. Space the nozzles on the boom to give uniform distribution in the swath in spite of swirl from propeller and vortexes at the wing tips.
- b. To Avoid Drift Damage from Aircraft application. Do not spray when wind is blowing toward a sensitive crop, shelterbelt or garden. Safe distances cannot be given. Do not spray in dead calm near sensitive plants. Do not apply volatile herbicides near a sensitive crop, shelterbelt or garden since the vapors rising from the field after application may be blown onto these plants.
- c. To Avoid Injury to Crops Use water as a carrier in preference to oil as injury is less likely. Apply at "safe" growth stage of the crop. Select the best chemical for the crop and weeds that are present and use only enough material for the degree of control desired.

## CONVERSION TABLES

### Benchmarks

*Standard Application Volume:*

40 litres per acre (L/ac) = 100 litres per hectare (L/ha)

*Standard Spraying Pressure:*

275 kilopascals (kPa) = 40 pounds per sq. inch (psi)

*Standard Speed For Spraying:*

9 kilometres per hour (km/h) = 5.6 miles per hour (mp/h)

*Standard Nozzle Spacing On A Spray Boom:*

50 centimetres (cm) = 20 inches (in)

*Standard Height Above Target for 80 Degree Nozzle Tips:*

45 centimetres (cm) = 18 inches (in)

*Standard Nozzle Tips:*

TeeJet 8002 or Delavan LF 2-80

**NOTE:** A standard nozzle has an output of 0.75 litres per minute at 275 kPa. At 9 km/h these nozzles will apply 40 litres of spray per acre.

### Metric Equivalents

1 acre = 0.405 hectare

2.471 acres = 1 hectare

6.9 kPa = 1 psi

1.6 km/h = 1 mp/h

2.54 cm = 1 inch

1 Litre/ac = 2.5 L/ha

## **GLOSSARY OF TERMS IN PEST CONTROL**

**AFOLAN F (linuron)**

Hoechst

1. FORMULATIONS: Dispersible - 450 g/L - 8 L containers.

2. REGISTERED MIXES: Afolan F+MCPA amine.

3. CROPS:

<b>Afolan F</b>	celery (9.0)	parsnips (7.0)	<b>Afolan F+MCPA (amine)</b>
asparagus (8.7)	corn(field, sweet)(6.5)	potatoes (8.7)	barley; oats
carrots (8.2)	dill (6.8)	shelterbelts (9.0)	spring wheat

4. WEEDS CONTROLLED:

**Afolan F**

barnyard grass (8.3)	goosefoot (8.4)	panicum, fall	shepherd's-purse (9.0)
buckwheat, wild (8.5)	groundsel (8.6)	pigweed (prostrate (8.7),	smartweed, annual (9.0)
chickweed, common (9.0)	knotweed	redroot (7.9))	sow-thistle, perennial seedling
corn spurry (8.7)	kochia (6.4)	purslane (8.4)	stinkweed (8.5)
dandelion, seedling (6.0)	lamb's-quarters (7.9)	radish, wild	velvetleaf
foxtail, yellow (6.2)	mustard, wormseed (6.0)	ragweed, common	
<b>Afolan F+MCPA amine</b>			
buckwheat	goat's-beard	mustard (ball, hare's-ear, Indian,	ragweed (common, giant (9.0))
(Tartary(7.9), wild(7.5))	hemp-nettle (7.5)	tumble, wild, wormseed)(8.8)	shepherd's-purse
burdock	kochia (5.8)	pigweed (prostrate (8.0),	smartweeds, annual (7.0)
chickweed, common (7.4)	lady's-thumb	redroot (7.8), Russian)	stinkweed (8.9)
cocklebur	lamb's-quarters (8.9)	radish, wild	stork's-bill (8.3)
cow cockle (6.8)	lettuce, prickly		

5. WEEDS SUPPRESSED: Green foxtail, field horsetail.

6. WHEN USED: **Afolan F: Asparagus, potatoes:** pre-emergent. **Carrots, parsnips, dill:** 2 or more leaves; before grassy weeds 5 cm tall, broad leaved weeds 15 cm. **Celery transplants:** as soon as new growth starts. **Fruit trees:** directed spray around trunk of trees established at least 10 years. **Shelterbelts:** apply before or immediately after weeds emerge, before 15 cm tall; no earlier than 10 days after transplanting. After buds open, apply as a directed spray. **Corn (field, sweet):** before corn emerges or as a directed spray on weeds after corn is at least 38 cm tall. **Afolan F+MCPA amine: Spring wheat, barley, oats:** when crop in 2-4 leaf stage and weeds in 1-4 leaf stage. Do not apply after tillering.

7. HOW TO APPLY:

With: Ground equipment.

**Rate:** **Wheat, barley, oats:** Afolan F - 200-250 mL/ac+MCPA amine 500: 440 mL/ac - lower rates when above average growing conditions and rainfall. **Asparagus:** Afolan F 1.5-2.0 L/ac. **Carrots, parsnips, dill:** Afolan F 575 mL-2.0 L/ac - higher rate on larger established weeds. **Celery transplants, corn (field, sweet), potatoes:** Afolan F 1.1-2.0 L/ac.

**Shelterbelts:** Afolan F 4.0 L/ac. **Fruit trees:** Afolan F - 4.0 L/ac. **Application method:** Afolan F+MCPA amine 500 - 40 L/ac water - 275 kPa - 9 km/h. Screens 50 mesh or larger - 80 x flat fan nozzles - adequate agitation required. Afolan F - 40-160 L/ac except on shelterbelts and fruit trees - directed spray required.

8. SPRAYING TIPS: Early application will avoid crop injury. Barley may suffer growth suppression, maturity delay and yield reduction which may be offset by control of heavy weed growth. Use only MCPA amine in mix to avoid crop injury, do not use very hard water with MCPA amine, and ensure adequate agitation. To avoid settling, spray soon after mixing. Make only 1 Afolan F application per crop year. Do not apply to crops under drought, heat or frost stress.

9. HOW IT WORKS: Afolan F: both systemic and contact, absorbed by roots and leaves. MCPA: systemic, absorbed by leaves.

10. EXPECTED RESULTS: First, browning of older leaf tips, then water soaked, wilted appearance, progressive yellowing, stem collapse, browning and death. MCPA promotes stem bending, twisting, leaf cupping. Incorrect timing of application, stress conditions, crusted soil or rain immediately after spraying will cause poor results.

11. EFFECTS OF RAINFALL: Requires rainfall or irrigation for activation of pre-emergent applications. Rainfall within 1 hour may decrease post-emergent effect. Unusually heavy rains after a pre-emergent application may cause severe injury to corn, carrots, or parsnips. Afolan F+MCPA amine - rainfall within 4 hours will detract from results.

12. MOVEMENT IN SOIL: Higher rates of Afolan F and extreme moisture may cause some leaching.

13. GRAZING AND CROPPING RESTRICTIONS: Do not graze or feed green plants to livestock. Do not apply within 60 days of harvest. No restriction on succeeding crops except if 2.0 L/ac or more is applied (possible 25% carryover to next season).

14. TOXICITY: Very low mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (1,500). May irritate eyes, skin, nose and throat. Toxic to fish.

15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) and goggles. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical aid in all cases.

16. STORAGE: Do not store below 5°C. If stored for 1 year or longer, shake well before using.

## AMIBEN (chloramben)

Union Carbide

1. FORMULATIONS: Solution - 240 g/L - 22.7 L containers. Granular - 10% - 22.7 kg bags.
2. REGISTERED MIXES: A tank mix of Amiben + Treflan for sunflowers.
3. CROPS: Asparagus (8.4), lima beans, pumpkins, red kidney beans, snap beans, squash, white (dry) beans (9.0). Amiben + Treflan - sunflowers (9.0) Underseeding: Not recommended.
4. WEEDS CONTROLLED:

barnyard grass (7.5)	foxtail	pigweed, redroot	smartweed, annual (7.9)
chickweed, common (9.0)	(green (6.1), yellow (5.1))	pigweed, prostrate (6.2)	stinkweed (8.0)
	lamb's-quarters (6.7)	ragweed	
	mustard, wild (8.3)		
5. WEEDS SUPPRESSED: None
6. WHEN USED: Pre-plant incorporated or post-plant pre-emergent.
7. HOW TO APPLY:
  - With: Ground equipment.
  - Rate: Asparagus, snap beans, squash, pumpkins - 3.8-5.6 L/ac. lima beans - 5.6 L/ac. White beans - 3.8 L/ac. Red kidney beans - 5.6 L/ac. Sunflowers - 3.7 L/ac Amiben plus 1.1 L/ac Treflan on medium to heavy soils or 800 mL/ac Treflan on light soils.
  - Water Volume: 40 L/ac
  - Incorporation: Not required for vegetable crops. Thoroughly incorporate within 8 hours into the soil in 2 directions at right angles to each other for sunflowers. Set implements to cut 8.0-10.0 cm deep.
  - Pressure: 275 kPa
  - Ground Speed: Operate disc implements at 6-10 km/h, cultivators 10-13 km/h.
8. SPRAYING TIPS:
  - (a) For proper incorporation follow Treflan label.
  - (b) Seed sunflowers within 1 week of application.
  - (c) A light cultivation with a vegetable crop will increase weed control when there is inadequate moisture to move the Amiben down but enough moisture to germinate the weeds.
9. HOW IT WORKS: Requires moisture for activation, it inhibits root development of seedling weeds for several weeks.
10. EXPECTED RESULTS: **Wild Mustard and Stinkweed:** Affected seedlings will not emerge from the ground. Control of cruciferous species will last for at least 6-8 weeks following treatment. **Poor results may be expected if:** (a) Application and incorporation when soil surface is wet. (b) Inadequate soil incorporation or the use of improper incorporation equipment. (c) Insufficient moisture to carry the chemical into the soil.
11. EFFECTS OF RAINFALL: In light soils a heavy rainfall may wash Amiben below the root zone of germinating weed seeds.
12. MOVEMENT IN SOIL: Water soluble.
13. GRAZING AND CROPPING RESTRICTIONS: None.
14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (3,500). May be a skin irritant. Non-toxic to fish and birds.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical attention.
16. STORAGE: Store in heated area. If freezing occurs store in a warm room at 10-27°C for several hours and agitate thoroughly before using to ensure all crystals are dissolved.

**AMITROL-T (amitrole)**

Union Carbide

1. FORMULATIONS: Solution - 200 g/L - 1 and 10 L containers.
2. REGISTERED MIXES: None.
3. CROPS: Spot treatment - pastures, shelterbelts, roadsides, fence rows, ditch banks. Total non-selective vegetation control.
4. WEEDS CONTROLLED:

Canada thistle (7.4)	hoary cress	quackgrass (5.3)	toadflax
cattails	leafy spurge	showy milkweed	most annual weeds
field horsetail (8.2)	poison-ivy	sow-thistle (annual, perennial)	
5. WEEDS SUPPRESSED: None.
6. WHEN USED: Canada thistle and sow-thistle (annual, perennial) - bud to bloom, hoary cress - rosette to bud, cattails - bud to seed, field horsetail - no restrictions, leafy spurge - seedlings to bloom, toadflax - rosette to pre-bud, quackgrass - 15 to 30 cm, showy milkweed - 5-30 cm. Crops - non-selective - spot treatment only.
7. HOW TO APPLY:  
**With:** Ground equipment, hand sprayer.  
**Rate:** Canada thistle, sow-thistle, quackgrass, toadflax, showy milkweed, hoary cress - 9-14 L/ac; leafy spurge, cattails - 18-22 L/ac; poison ivy - 4.5 L/ac.  
**Water Volume:** 80-200 L/ac  
**Pressure:** 150-275 kPa  
**Ground Speed:** Spot treatment.
8. SPRAYING TIPS: Spray to point of run-off, complete coverage of weeds essential. Do not till or mow for 3 weeks.
9. HOW IT WORKS: Systemic herbicide which inhibits chlorophyll production. Moves through foliar and root system.
10. EXPECTED RESULTS: Whitening begins in 7-14 days and plants die. Short term residual. **Poor results may be expected if:** poor coverage, inadequate rate, plants over mature or under drought stress. Tillage too soon after application.
11. EFFECTS OF RAINFALL: Heavy rain within 10-12 hours reduces effectiveness.
12. MOVEMENT IN SOIL: At recommended rates - persists in soil 4-6 weeks.
13. GRAZING AND CROPPING RESTRICTIONS: Do not graze treated area for 6 months. Most crops susceptible to drift.
14. TOXICITY: Oral LD<sub>50</sub> rats (mg/kg) = (24,600). May be irritating to skin and eyes; has potential to cause health problems after prolonged, continuous exposure. Non-toxic to fish and birds.
15. PRECAUTIONS, FIRST AID: Do not apply on foraging bees. Wear standard protective clothing (see page 2) to avoid exposure. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical attention.
16. STORAGE: Do not freeze or store above 50°C. No shelf life limitation. If frozen, contents will crystallize - to resuspend warm to 27°C and agitate as necessary.

**AMIZINE (amitrole + simazine)**  
Union Carbide

1. FORMULATIONS: Solution - Amitrol - 53 g/L + simazine 106 g/L - 20 L pack.
2. REGISTERED MIXES: None. Mix restrictions: See "Soil Sterilants" page 4.
3. CROPS: Industrial sites and non-cropped areas only.
4. WEEDS CONTROLLED: All broad-leaved weeds and grasses.
5. WEEDS SUPPRESSED: Not applicable.
6. WHEN USED: Apply in spring or early summer - weeds small - dandelion, green foxtail, kochia, lamb's-quarters, annual smartweeds, plantain, purslane, wild oats, redroot pigweed, grasses - 1-19 cm tall.
7. HOW TO APPLY:  
**With:** High volume ground sprayer - hand sprayer.  
**Rate:** Ground sprayer - 35 L/ac - hand sprayer 800 mL/100 m<sup>2</sup>  
**Water Volume:** 200 L/ac - hand sprayer 8-12 L/100 m<sup>2</sup>  
**Pressure:** 275 kPa  
**Nozzles:** Tee-Jet 8002 or larger fan nozzles.
8. SPRAYING TIPS: Use no finer than 50 mesh size screens.
9. HOW IT WORKS: absorbed by roots and moves through plant. Affects chlorophyll - plant whitens and dies slowly. Simazine remains in soil giving control for 1 growing season.
10. EXPECTED RESULTS: Plants turn white in 7-14 days and are usually dead in 3 weeks. Area should remain weed free for 1 season.
11. EFFECTS OF RAINFALL: Rainfall will carry chemical into root zone and speed action.
12. MOVEMENT IN SOIL: adsorbed on soil particles and resists leaching by rainfall.
13. GRAZING AND CROPPING RESTRICTIONS: not applicable. Lilac, privet, honeysuckle, barberry are very susceptible to drift.
14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = amitrole (24,600), simazine (5,000). Has potential to cause health problems after prolonged, continuous exposure or may cause dermatitis. Non-toxic to fish and birds. May be toxic to bees.
15. PRECAUTIONS AND FIRST AID: Do not apply when bees are foraging. Wear standard protective clothing (see page 2) to avoid exposure. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical attention.
16. STORAGE: Do not freeze to avoid crystallization. If frozen, warm, agitate until crystals redissolve.

## ASULOX F (asulam)

May and Baker

1. FORMULATION: Solution - 400 g/L - 20 L pack.
2. REGISTERED MIXES: Asulox F + Buctril M (Flax). Asulox F + Embutox (seedling and established alfalfa grown for seed). Mix restrictions: Add the required amount of Buctril M and mix, then add Asulox F.
3. CROPS: Flax (8.3), seedling and established alfalfa, grown for seed (8.3). Underseeding - Flax underseeded to alfalfa.
4. WEEDS CONTROLLED: Wild oats (7.8).
5. WEEDS SUPPRESSED:

barley (3.3)	buckwheat, wild (5.3)	oats, volunteer (6.7)	stinkweed (8.6)
barnyard grass	foxtail, green (6.3)	smartweed, annual (7.1)	wheat (3.0)
bluebur	mustard, wild (8.0)		
6. WHEN USED: 2-4 leaf stage of wild oats when flax 2.5-15 cm tall. Alfalfa when beyond first trifoliate leaf stage.
7. HOW TO APPLY:

With: Ground equipment. Floaters not recommended.

Rate: 1.1 L/ac

Water Volume: 20-40 L/ac

Pressure: 275 kPa

Nozzles: Flooding tips are not recommended.
8. SPRAYING TIPS:
  - (a) Do not spray unthrifty crops or flax under stress due to drought or excess soil moisture.
  - (b) Do NOT spray in hot, humid weather conditions or when crop is wet with dew.
  - (c) Flax will likely sustain injury if grown on low fertility soils.
9. HOW IT WORKS: Absorbed by leaves and translocated; inhibits cell division in the growing points of the plant. Symptoms are severe yellowing of new leaves, stunting and finally death. Growing points are killed within 1-2 weeks but full effect occurs by the fourth week.
10. EXPECTED RESULTS: **Wild oats:** Start to yellow about 1 week after application. Wild oat plants not at the recommended growth stage or those that emerge after spraying will be unaffected. **Crop:** Temporary slight yellowing of the flax leaves may occur a few days after spraying. Crop recovery from wild oat competition may be slow if the weeds have been allowed to smother the flax. Stunting and delay in maturity may be noticed. **Poor results may be expected:** with incorrect spray volume or ground speed; improper stage of wild oats; spraying when foliage is wet with dew; spraying when flax is under stress or in hot, humid weather.
11. EFFECTS OF RAINFALL: Rainfall within 8 hours may seriously affect activity.
12. MOVEMENT IN SOIL: Not applicable.
13. GRAZING AND CROPPING RESTRICTIONS: **Drift:** Danger from drift is low, but cereals may be slightly yellowed. **Grazing Restrictions:** Do not graze or feed crop.
14. TOXICITY: Low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (5,000). Non-toxic to birds, fish and bees.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) to prevent contact with skin and eyes. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical attention.
16. STORAGE: Heated storage. If frozen, redissolve crystals by storing in a warm room and thorough agitation.

## ATRAZINE

Ciba-Geigy / Chipman

1. FORMULATIONS: Aatrex Liquid - Ciba Geigy - Liquid 500 g/L - 10 L pack. Aatrex Nine-O - Ciba Geigy - 90% water dispersible granule - 4.5 kg and 10 kg bag. Aatrex Plus - Ciba Geigy - flowable - 400 g/L + 25% oil concentrate - 20 L container. Atra-Mix - Chipman - flowable - 400 g/L + 25% oil concentrate - 2 x 10 L/case. Atrazine F - Chipman - 500 g/L - 2 x 10 L/case. Atrazine 90W - Chipman - 90% WP - 10 x 2 kg/case.
2. REGISTERED MIXES: Aatrex Plus and Atra-Mix - none. Aatrex Nine-O, Aatrex Liquid - with corn oil concentrate, nitrogen solutions or complete liquid fertilizers, Dual Ciba-Geigy 960, Bladex and Sutan +.
3. CROPS: All corn.
4. WEEDS CONTROLLED:

Atrazine	lamb's-quarters	oats, wild	Atrazine + Dual Ciba-Geigy
barnyard grass	mustards	pigweed, redroot	foxtail (green, yellow)
buckwheat, wild	purslane	smartweed	
clover, volunteer	ragweed		
5. WEEDS SUPPRESSED: None.
6. WHEN USED: Aatrex Nine-O, Aatrex Liquid, Atrazine F, Atrazine 90W - pre-plant, pre-emergent, post-emergent or band applied. Aatrex Plus, Atra Mix - mainly post-emergent but may be used pre-emergent, after planting corn.
7. HOW TO APPLY:

With: Ground equipment.

Rate: **Aatrex Liquid** - 1.3-2.7 L/ac. **Aatrex Liquid** 1.3-1.8 L/ac + 6.9 L/ac emulsified oil in 60-120 L/ac of water. **Aatrex Nine-O** - 0.8-1.5 kg/ac. **Aatrex Plus** - 1.7 L/ac. **Atra-Mix** - 1.8 L/ac on light, sandy soil; 2.3 L/ac on loam or clay; 3.4 L/ac on high organic soils. **NOTE:** Vary rates according to different soil types.

**Quackgrass Control:** Atra-Mix and Aatrex Plus - Apply 2.2 L/ac to quackgrass foliage in fall or early spring. Cultivate 1-3 weeks later, plant corn. Repeat chemical treatment as early post-emergent.

**Water Volume:** 60-120 L/ac

**Incorporation:** Only Aatrex Liquid and Aatrex Nine-O are applied pre-plant; Aatrex Plus can be applied as pre-emergent. Do not incorporate deeper than 5.0 cm.

**Pressure:** 200-300 kPa
8. SPRAYING TIPS:
  - (a) Do not mix oil concentrates, surfactants or hormone type herbicides with any mixture of Atrazine plus Bladex.
  - (b) When preparing a tank mix - add Atrazine to the tank of water first, agitate, add Bladex slowly and agitate thoroughly.
  - (c) Continuous gentle agitation is needed, but avoid excessive agitation, especially with mixtures with oil, or a grease like mass may form.
  - (d) Use 50 mesh or larger strainers and use only metal filters.
  - (e) Bypass line should discharge to bottom of tank.
  - (f) If mixes containing oil are used, use at once and clean tank and system with a strong detergent solution.
  - (g) Band treatments are desirable when cultivation is to alleviate hard soil conditions or to control annual weeds.
9. HOW IT WORKS: Inhibits photosynthesis.
10. EXPECTED RESULTS: Weeds slow to emerge or under drought conditions will be killed when moisture improves. Heavy rainfall on sandy soils may cause leaching, a decrease in efficacy and off target injury.
11. EFFECT OF RAINFALL: Rainfall will activate the chemical, carrying it into the root zone where kill will begin.
12. MOVEMENT IN SOIL: Heavy rainfall on sandy soils may cause leaching and soil movement.
13. CROPPING AND GRAZING RESTRICTIONS: Plant only to corn in year of treatment. Sugar beets should not be planted for 2 years following the growing season in which Atrazine is used. Crops most tolerant to Atrazine, next to corn, are sorghum then flax, fababeans and peas. Latter crops may be seeded in the season following Atrazine application if rates were not greater than 40 g/ac of active Atrazine. Crop injury to succeeding crops may occur if there is an extended period of dry weather during year of treatment. Injury is most likely to occur on seedling crops subjected to periods of stress such as hot, dry weather. **To reduce Atrazine residues:** Thorough tillage, including ploughing should precede the planting of crops other than corn. Uneven application of Atrazine or application in excess of recommended rates will not injure corn but may result in injury to other succeeding crops.
14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (3,080). May cause eye irritation. Low toxicity to fish and birds.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) and goggles. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF AATREX PLUS or ATRA-MIX SWALLOWED - do NOT induce vomiting. Get medical attention. IF AATREX LIQUID, AATREX 90W, AATREX NINE-O or AATREX 80W SWALLOWED - induce vomiting (see page 3). Get medical attention.
16. STORAGE: The flowable formulations should be kept from freezing. If stored in unheated areas the product should be warmed and agitated thoroughly prior to using.

AVADEX BW (triazlate)  
Monsanto



WARNING POISON

1. FORMULATIONS: Emulsifiable Concentrate: 400 g/L - 22.7 L Granular 10% - 22.7 kg bags
2. REGISTERED MIXES: Avadex BW + Treflan or Rival. Dry bulk or liquid fertilizers, thorough mixing is essential.
3. CROPS: Barley (8.9), flax (8.9), mustard (9.0), peas (field) (9.0), wheat (durum (8.3), spring), rapeseed (8.2). Underseeding: Alfalfa, clovers, and bird's-foot trefoil may be seeded into Avadex treated soil provided they are not harvested for green feed, silage or hay in the year of seeding.
4. WEEDS CONTROLLED: Wild oats (7.6)
5. WEEDS SUPPRESSED: None
6. WHEN USED: **Spring:** Pre-plant incorporated on rapeseed, flax, mustard, peas. Post-plant incorporated on wheat and barley. **Fall:** All crops. Granules: September 15 to freeze-up. Liquid: October 1 to freeze-up.  
**NOTE:** Where soil drifting is a problem, only granules are recommended for fall applications.

7. HOW TO APPLY:

With: Aircraft (granules only) or ground equipment

Rate:

(a) Spring Application

Crops	Application Timing	Organic Matter			
		Liquid L/ac	4% or Less Granules kg/ac	Liquid L/ac	Greater than 4% Granules kg/ac
Spring wheat	Before seeding	1.2	4.4	1.4	5.7
Durum wheat	After seeding	1.4	5.7	1.7	6.9
Barley	Before and after seeding	1.4	5.7	1.7	6.9
Rapeseed, flax, mustard, sugar beets	Before seeding	1.7	6.9	2.2	8.9
Peas (dry)	Before seeding	1.7	-	1.7	-

(b) Fall Application

Crops	Organic Matter				Greater than 4%	
	Less than 2%	2-4%	Liquid L/ac	Granules kg/ac	Liquid L/ac	Granules kg/ac
Spring and durum wheat	1.2	4.4	1.4	4.4	1.7	6.9
Barley	1.2	4.4	1.4	5.7	1.7	6.9
Rapeseed, flax, mustard, sugar beets	1.4	5.7	1.7	6.9	2.2	8.9

Water Volume: Liquid only - minimum of 40 L/ac

Incorporation: Two incorporations at right angles are required for thorough mixing. **For liquid**, the first incorporation should be completed as soon as possible on the day of spraying. **For granules**, the first incorporation should be completed within 48 hours of application. The second incorporation for both liquid and granules may or may not be done immediately after the first. For maximum results from spring application of granules, delay second incorporation for at least 3-5 days.

implements: Use a double disc or light cultivator plus harrows for pre-plant incorporation. Heavy duty harrows must be used for post-plant incorporation.

Pressure: Liquid only - 200 kPa.

NOTE: **Not recommended where soil erosion is a problem.**

8. SPRAYING TIPS:

- Use liquid formulation on soils free of trash; use granules on all soils including those with heavy trash cover. For fall application the granule formulation is best suited.
- Incorporation equipment should be operated at 9 km/h.
- Operate double discs and cultivators at a depth of 7.5 cm.
- Do not incorporate into wet soil.
- Straw, lumps of soil, etc. dragged by harrows will cause uneven incorporation resulting in reduced wild oat control.
- On stubble, incorporate with double disc or cultivator followed by harrowing at right angles.
- On fallow, use 2 harrowings at right angles if the soil is loose and free of trash and lumps.
- Incorporation of Avadex BW/urea combination is recommended as follows: **Spring:** all crops. Incorporate immediately after spreading. Only pre-plant incorporated applications recommended. For best results delay second incorporation for at

least 3-5 days. **Fall:** Applications should be followed immediately by a shallow discing or cultivation. In the spring prior to seeding, a shallow cultivation at right angles to the fall operation is recommended. **NOTE:** Fall application is not recommended where erosion may be a problem.

- (i) After seeding, any deep ridges left by drills must be levelled by harrowing.
- (j) Drought conditions in the year of treatment may result in higher levels of Treflan/Rival carryover. To avoid wheat injury, seed 6.0-7.5 cm into warm, moist seedbed.
- (k) Granules may be applied in the fall prior to or in conjunction with fertilizer banding.
- (l) Rapeseed, mustard and flax can be seeded in treated layer. Barley and wheat are more sensitive and should be planted 6.0-7.5 cm. Wheat must be seeded below the treated layer.

9. HOW IT WORKS: Absorbed by wild oat shoots, usually resulting in death before emergence. Under dry conditions wild oats may emerge before being killed.

10. EXPECTED RESULTS: **Wild oats:** Usually kills wild oats before they emerge. Scraping away the soil 1-2 weeks following treatment will expose white to yellow wild oats shoots 2.0-2.5 cm in length with pinched tips. Plants which have emerged and absorbed a lethal dose will cease growth, leaves become brittle and bluish-green in color. Under dry conditions, a rainfall of 1.5 cm or more when wild oats are emerging, can cause post-emergent die-back of a high percentage of wild oat plants. **Crop:** Wheat seeded into the treatment zone under very dry soil conditions may be thinned and delayed when germinating and emerging just prior to a heavy rainfall. Wheat must be seeded at least 1.5 cm below the treated layer of soil (eg. 5-7.5 cm). **Poor results may be expected if:** Incomplete incorporation due to wet, cloddy soil, or heavy trash. Incorporation delayed, very dry soil conditions, in spring or prolonged cool soil temperatures at time of germination. Ridges left by seeding may disrupt the treated layer and allow escapes. Equipment deficiencies such as very light harrows.

11. EFFECTS OF RAINFALL: Moisture is required for activation.

12. MOVEMENT IN SOIL: Negligible

13. GRAZING AND CROPPING RESTRICTIONS: **Drift:** No effect on standing crops. **Grazing Restrictions:** None. **Crop Use After Hail:** No restrictions. **Succeeding Crops:** Oats should not be seeded into soil treated with Avadex BW in the previous year.

14. TOXICITY: Low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (1,675-2,165). May cause slight eye irritation. Slightly toxic to fish, non-toxic to birds.

15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) to avoid getting chemical on skin or in the eyes. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - Do NOT induce vomiting. Get medical attention.

16. STORAGE: Store above 0°C. If frozen, warm to 20°C and agitate to redissolve crystals.

## AVENGE 200C/640 (difenoquat)

Cyanamid



WARNING POISON

1. FORMULATION: Solution - 200 g/L - 20 L. Soluble Powder - 640 g cation/kg, 25 kg.
2. REGISTERED MIXES: Both formulations can be tank-mixed with Torch or Pardner; Buctril M; Brominal M; Bromox 450; Sabre; 2,4-D Ester (wheat and barley only); MCPA ester and with MCPA ester+Torch or Pardner; Glean. Do not apply Avenge+Glean tank mix to canary grass. **Mix restrictions:** With agitation running, add broad-leaved herbicide to 1/2 of the water then add the rest of water, and add Avenge 200C. With the Glean mix - ensure Glean is thoroughly dissolved before adding Avenge 200C. Do not add surfactant with 200C/Glean mix. Surfactant required for Avenge 640 is all needed for 640/Glean mix.
3. CROPS: **Barley:** all varieties. **Canary Grass.** **Fall Rye:** Cougar, Frontier, Kodiak, Puma, Rymin. **Spring Wheat:** Benito, Canuck, Chester, Columbus, Fielder, Glenlea, HY320, Katepwa, Leader, Macoun, Neepawa, Selkirk. **Triticale:** Carman, Welsh. **Winter Wheat:** Norstar, Sundance. **Forages Underseeded to Wheat or Barley:** Alfalfa, bird's-foot trefoil, bromegrass, clover (red, sweet), crested wheatgrass, fescue (creeping red, red, meadow), Kentucky bluegrass, orchard grass, reed canary grass, Russian wildrye grass, timothy.
4. WEEDS CONTROLLED: Wild oats (7.5)
5. WEEDS SUPPRESSED: None
6. WHEN USED: Treat at 3-4 leaf stage to minimize early wild oat competition, and 4-5 leaf stage for better control. Do not apply to barley, wheat or canary seed after 6 leaf stage of crop. Do not use Avenge+Glean mix in the brown soil zone and use no surfactant with the mixture.
7. HOW TO APPLY:
 

**With:** Aircraft or ground equipment. Do not apply Avenge/Glean mix by air.

**Rate:**

Ground Application		Aerial Application		
200C	640	200C	640	
More than 200 wild oat plants/m <sup>2</sup>	1.7 L/ac	525 g/ac + 600 mL/ac. Agral 90/AgSurf.	1.7 L/ac	525 g/ac + 120-300 mL/ac. Agral 90/AgSurf.
Less than 200 wild oat plants/m <sup>2</sup>	1.4 L/ac	445 g/ac + 600 mL/ac. Agral 90/AgSurf.	1.4 L/ac	445 g/ac + 120-300 mL/ac. Agral 90/AgSurf.

For registered mixes use the recommended rate of Avenge and the label recommended rate of other herbicide. Use up to 0.45 L/ac of MCPA ester or 2,4-D ester 500 and 1.4 or 1.7 L/ac of Avenge.

**Water Volume:** **Avenge 200C:** Aircraft - Minimum 8 L/ac; Ground - 40 L/ac; Spra-Coupe - 40 L/ac. **Avenge 640:** Aircraft - 8-20 L/ac; Ground - 40 L/ac.

**Incorporation:** Not applicable

**Pressure:** 275 kPa
8. SPRAYING TIPS: (a) Nozzle should be tilted 45° forward for better spray penetration. (b) If foaming is a problem use a silicone-based anti-foam agent. (c) No restriction on following pesticide applications. (d) Do not spray if crop heavy with dew. (e) Use 50 mesh metal screens and filters when applying Avenge. (f) When using Glean mix, follow Glean label.
9. HOW IT WORKS: This chemical acts on the growing point located at or just above the soil surface and placing herbicide at or below this point is most efficient. It disrupts cell division and elongation causing growth to stop. Works best at high temperature and humidity.
10. EXPECTED RESULTS: **Wild Oats:** Start to yellow within 3-5 days after application. Effect will be faster when temperature and humidity are high. Affected plants will turn brown or remain stunted and partially green throughout the season. Wild oats in the 1-2 leaf stage at spraying or those that emerge after spraying will be unaffected. **Crop:** A slight yellowing of the crop may be visible 5-7 days after application and will remain visible for 2 weeks. **Poor results may be expected if:** Spraying before 3 leaf stage; too low a rate of Avenge for the wild oat population; inadequate coverage due to dense broad-leaved weed population; drought or temperature stress.
11. EFFECTS OF RAINFALL: Rainfall within 6 hours will seriously decrease activity.
12. MOVEMENT IN SOIL: Not applicable.
13. GRAZING AND CROPPING RESTRICTIONS: **Drift:** Only oats can be seriously affected by drift. **Grazing Restrictions:** Do not graze or feed crop for 8 weeks after treatment. Treated underseeded forages should not be grazed or harvested for feed during the year of seeding. **Crop Use After Hail:** Do not use for 8 weeks after treatment.
14. TOXICITY: High acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (270). Non-toxic to fish, birds or bees.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) and goggles to prevent contact with skin and eyes. **Symptoms of poisoning:** headaches, tiredness and diarrhea. No long term health problems noted.  
**First Aid:** IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical aid in all cases.
16. STORAGE: All Avenge 200C now in circulation (since and including 1983 production) will withstand freezing temperatures, returning to full solution as temperature warms.

**BANVEL (dicamba)**

Velsicol

**CAUTION POISON**

1. FORMULATIONS: Solution 400 g/L, 10 L. Solution 480 g/L, 9.5 L. The 480 g/L formulation is being introduced in 1986. Please know which formulation you have before using the rates outlined in "How to Apply".

2. REGISTERED MIXES: Banvel + 2,4-D (amine or L.V. ester). Banvel + MCPA amine. Banvel + MCPA K. Banvel + Sencor or Lexone (metribuzin). Banvel + Roundup.

## 3. CROPS:

barley (8.2)	grass, canary	oats (8.6)	reduced tillage
corn, field	grasses (established turf,	rye, spring	noncrop areas
fescue, red (seed crops)	pasture, rangeland)	wheat (durum, spring, winter)(8.2)	(stubble, summerfallow)

## 4. WEEDS CONTROLLED:

Banvel Alone*	Banvel + Roundup (Reduced Tillage)	Banvel + 2,4-D
buckwheat	buckwheat, wild**	lady's-thumb
(Tartary(6.7), wild(7.9))	cereals, volunteer	lamb's-quarters
cleavers**(6.4)	cow cockle	mustard, wild
cow cockle (7.0)	flixweed**	oats, wild
lady's-thumb (6.4)	foxtail, green	rapeseed, volunteer
smartweed, green (6.5)	kochia	stinkweed
spurry, corn (6.0)		thistle, Russian

\* Registered tank mixes will control these weeds plus weeds controlled by the other herbicide in the mix.

\*\* Suppression or control dependent on rates used.

## 5. WEEDS SUPPRESSED: Banvel will control top growth of Canada thistle, and perennial sow-thistle at in-crop rates.

Banvel + Roundup mix will suppress red root pigweed, and foxtail barley.

## 6. WHEN USED:

## (a) Timing of Application

## Recommended Leaf Stage or Height of Crop:

Crop	Banvel Alone	Banvel + 2,4-D Amine-500	Banvel + MCPA Amine-500	Banvel + MCPA K-400	Banvel + Metribuzin
wheat (spring, durum)	2-5	2-5	2-5	2-5	2-4 (spring wheat only)
oats	2-5	-	2-5	2-5	-
barley	2-5	2-5	2-5	2-5	2-3
spring rye	2-3	2-3	-	-	-
wheat (winter)	15-25 cm	15-25 cm	15-25 cm	15-25 cm	
canary grass	3-5	-	3-5	-	-
corn (post emergence)	up to 20 cm (drop nozzles)	up to 10 cm 20-50 cm	10-50 cm	-	-

## (b) Other Uses

(1) **Crop-free land (Canada thistle, perennial sow-thistle, field bindweed).** (a) Summerfallow: Banvel alone, cultivate in spring. Apply before thistles reach early bud stage (15-25 cm tall); when field bindweed is flowering.

Banvel + Roundup + non-ionic surfactant, for Canada thistle or perennial sow-thistle only. Tillage and timing practices same as above. (b) Stubble: Banvel alone or Banvel + Roundup + non-ionic surfactant, Apply to thistle regrowth when 10-15 cm tall. Apply 2 weeks prior to first killing frost.

(2) **Reduced Tillage for annual weeds, summerfallow**: apply Banvel + Roundup + non-ionic surfactant to actively growing weeds from 8-15 cm tall.

(3) **Pastures, Rangeland Grasses**: Apply when weeds are actively growing or when brush species are under 2 m tall.

(4) **Red fescue**: Apply when new seedling stands are 5.0 cm tall. In established stands, apply up to shot blade stage.

## 7. HOW TO APPLY:

**With:** Ground equipment. Air (Banvel or Banvel + phenoxy mixes only.) Use only 110 mL/ac (400 g/L) or 95 mL/ac (480 g/L) when applying Banvel by air.

**Rate:** See tables for 400 g/L and 480 g/L.

**Water Volume:** Wheat, oats, barley, spring rye, red fescue, canary grass - 45 L/ac. Corn - 90-140 L/ac.

Summerfallow/stubble (thistles) 45-90 L/ac. Reduced Tillage 20-40 L/ac. Pastures and Rangeland grasses (see product rate table). Air - not less than 8 L/ac.

**Pressure:** 275 kPa; For air do not use nozzle pressure above 200 kPa.

**BANVEL 400 g/L FORMULATION**

	Banvel	Banvel+2,4-D	Banvel+MCpa	Banvel+MCpa	Banvel+Metribuzin
Crop	Alone	Amine-500	Amine-500	K-400	(Sencor OR Lexone DF)
wheat (spring, durum)	mL/ac	mL/ac+mL/ac	mL/ac+mL/ac	mL/ac+mL/ac	ml/ac+mL/ac OR g/ac
oats	110-140	110-140+340	110-140+340	110-140+445	110+110-170 mL OR 110 g
barley	110	110+340	110+340	110+445	-
spring rye	110-140	110-140+340	-	-	-
wheat (winter)	110-140	110-140+340	110-140+340	110-140+445	-
canary grass	140	-	140+340	-	-
corn (field)	285	140+340	-	-	-
red fescue	285	285+600	-	-	-
 Other Uses	 Banvel	 Banvel+2,4-D	 Banvel+2,4-D	 Banvel+2,4-D	 Banvel+Roundup+
summerfallow/	Alone	Amine-500	L.V. Ester-600	L.V. Ester-600	non-ionic surfactant
stubble - thistle	L/ac	rate/ac	rate/ac	rate/ac	mL/ac+mL/ac+mL/ac
(Canada, sow)	1.2 L	-	-	-	610+690+142
reduced tillage	-	-	-	-	140-280+305-400+142
<b>Pastures and Rangeland Grasses</b>					
weed control	1.0-2.2 L	1.0 L+0.9 L	1.0 L+0.75 L	-	-
brush control	-	2.5 L+4.0 L in 1000 L water	2.5 L+3.3 L in 1000 L water	-	-

**BANVEL 480 g/L FORMULATION**

	Banvel	Banvel+2,4-D	Banvel+MCpa	Banvel+MCpa	Banvel+Metribuzin
Crop	Alone	Amine-500	Amine-500	K-400	(Sencor OR Lexone DF)
wheat (spring, durum)	mL/ac	mL/ac+mL/ac	mL/ac+mL/ac	mL/ac+mL/ac	ml/ac+mL/ac OR g/ac
oats	95-115	95-115+340	95-115+340	95-115+445	95+110-170 mL OR 110 g
barley	95	95+340	95+340	95+445	95+110-170 mL OR 110 g
spring rye	95-115	95-115+340	-	-	-
wheat (winter)	95-115	95-115+340	95-115+340	95-115+445	-
canary grass	115	-	115+340	-	-
corn (field)	245	115+340	-	-	-
red fescue	245	245+600	-	-	-
 Other Uses	 Banvel	 Banvel+2,4-D	 Banvel+2,4-D	 Banvel+2,4-D	 Banvel+Roundup+
summerfallow/	Alone	Amine-500	L.V. Ester-600	L.V. Ester-600	non-ionic surfactant
stubble - thistle	L/ac	rate/ac	rate/ac	rate/ac	mL/ac+mL/ac+mL/ac
(Canada, sow)	1.0 L	-	-	-	510+690+142
reduced tillage	-	-	-	-	115-245+305-400+142
<b>Pastures and Rangeland Grasses</b>					
weed control	0.85-1.9 L	0.85 L+0.90 L	0.85 L+0.75 L	-	-
brush control	-	2.1 L+4.0 L in 1000 L water	2.1 L+3.3 L in 1000 L water	-	-

Broadcast ground application of Banvel+2,4-D in 90-130 L/ac of water as follows:

Brush Species	400 g/L Formulation	480 g/L Formulation
<i>Aspen Poplar</i>	1.5 L/ac+1.7 L/ac 2,4-D Amine-500 OR 1.5 L/ac 2,4-D Ester-600.	1.3 L/ac+1.7 L/ac 2,4-D Amine-500 OR 1.5 L/ac 2,4-D Ester-600.
<i>Wild Rose</i>	1.7 L/ac+1.7 L/ac 2,4-D Amine-500 OR 1.5 L/ac 2,4-D Ester-600	1.5 L/ac+1.7 L/ac 2,4-D Amine-500 OR 1.5 L/ac 2,4-D Ester-600
<i>Western Snowberry</i>	1.7 L/ac+1.5 L/ac 2,4-D Ester-600	1.5 L/ac+1.5 L/ac 2,4-D Ester-600

8. SPRAYING TIPS:

- (a) Flat fan nozzles are more efficient than flooding tips.
- (b) Do not spray if rain is expected within 4 hours of application.
- (c) Best application is when crop is under good growing conditions and air temperature 10-25°C.
- (d) Avoid application if risk of frost or severe drop in night temperature is forecast.
- (e) Avoid application when crop is under stress from adverse environmental conditions.
- (f) Crop damage can occur if the chemical is applied at any time other than the recommended crop stage.

9. HOW IT WORKS: Absorbed through roots and leaves and translocated in phloem and xylem, disrupting the metabolism.

10. EXPECTED RESULTS: **Weeds:** Results may take 10-14 days to appear. Proliferation of tissues in plant causes: twisting, bending of main stem, leaf petioles; cupping of leaves; increase in root size; stimulation of fibrous root production. Better control of cleavers may be obtained by spraying them before the 3 whorl stage. **Crops:** Under certain growing conditions shortening of straw can occur in treated crops without having adverse affect on crop yield. If applied at other than recommended crop stage, head and stem deformities may occur. Crops under stress from excess moisture, drought, disease, etc. may suffer a further setback from Banvel. The crop injury that occurs may be offset by the weed control obtained. **Poor results may be expected if:** it rains within 4 hours of application, or when older weeds are sprayed, or if less than the recommended water volume is used.

11. EFFECTS OF RAINFALL: Rainfall more than 4 hours after application will not reduce effectiveness.

12. MOVEMENT IN SOIL: Not applicable.

13. GRAZING AND CROPPING RESTRICTIONS: **Drift:** Can harm ornamentals and other desirable trees or plants. **Grazing Restrictions:** Do not graze wheat, barley or spring rye prior to maturity. **Corn:** Do not graze cattle or harvest for silage until 7 days following treatment with Banvel alone or Banvel plus 2,4-D amine. **Canary grass:** Canary seed should only be used as bird seed. **Succeeding Crops:** No restrictions unless Banvel has been applied at 1.2 L/ac (400 g/L) or 1.0 L/ac (480 g/L) on fallow or stubble. Then grow only cereals or field corn the following year. If this application is made after September 1 or if soil is dry subsequent to application, crop injury may occur in the following spring. If a Banvel+Roundup treatment is used for thistle control then rapeseed as well as cereals or field corn can be grown the following year. **Grazing Restrictions for Beef cattle and other meat animals:** If treated vegetation has been consumed by meat animals within 30 days of Banvel application, feed the animal with untreated diet for 30 days before slaughter. Meat animals may graze or feed on treated pasture 30 days after Banvel application without restrictions on slaughter.

**Grazing and Hay Restrictions for Dairy Cattle:**

Rate/acre (400 g/L Formulation)	Days Delay Between Treatment and Grazing or Cutting For Hay
Up to 600 mL Banvel	0
600 mL-1.1 L Banvel	7
1.1-2.2 L Banvel	14
2.2-4.4 L Banvel	30

14. TOXICITY: Low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = technical (1,700-2,900). May cause mild skin irritation and extreme eye irritation and swelling. Non-toxic to fish and birds.

15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) to reduce exposure. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical attention.

16. STORAGE: If frozen, shake thoroughly before use. No activity is lost if completely resuspended.

**BANVEL 10G (dicamba)**

Velsicol



CAUTION POISON

1. FORMULATIONS: Granular 10% - 11.34 kg pail.
2. REGISTERED MIXES: None
3. WHERE USED: Non-crop areas (summerfallow, stubble, pastures and other areas such as fence rows and roadways).
4. VEGETATION CONTROLLED:

alder	bindweed, field	pin cherry	willow
aspen poplar	birch	spruce	
balsam fir	elm	thistle, Canada	

5. WEEDS SUPPRESSED: Not applicable.
6. WHEN USED: **Brush:** Apply in spring or early summer to brush or tree species up to 2 m in height. **Canada thistle, field bindweed:** Apply when plants are actively growing
7. HOW TO APPLY:  
**With:** Granular, broadcast-type spreader or with gloved hands.  
**Rate:** **Brush control:** 20.4-28.1 kg/ac (Use higher rate on sandy or rocky soils or in areas of high rainfall). **Canada thistle, field bindweed:** 22.7 kg/ac.
8. SPRAYING TIPS:
  - (a) Do not apply Banvel 10G under desirable trees or other desirable plants or where these roots might extend.
  - (b) When used on summerfallow apply to weed patches following a spring cultivation. For stubble apply to regrowth after harvest and 2 weeks before a killing frost.
  - (c) If application is made to stubble land it must be fallowed the following year unless possible carryover of chemical is not objectionable.
  - (d) Applications on cultivated land cannot exceed 1.2 acres in any 1 field and the total treated areas are not to be in excess of 2.5% of the total acreage of the field.
9. HOW IT WORKS: Rainfall moves dicamba into the root zone for uptake. A disruption of the metabolic and growth activities occurs within the plant.
10. EXPECTED RESULTS: Injury to treated vegetation may not be apparent until the following year particularly if dry conditions are present. Effect on broadleaved weeds results in twisting and bending on the main stem, cupping of leaves, increase in root size and stimulation of fibrous root production. Spot treatment may temporarily stunt the growth of desirable grasses or crops planted in the treated area the following year.
11. EFFECTS OF RAINFALL: Rainfall following application of Banvel 10G is necessary to move it into the root zone for uptake by weeds and brush.
12. MOVEMENT IN SOIL: Downward movement in the soil is faster in sandy or rocky soils and in areas of heavy rainfall.
13. GRAZING AND CROPPING RESTRICTIONS: **Dairy Cattle Grazing:** Pasture and rangeland grasses may be grazed or harvested 60 days after treatment. **Beef Cattle Grazing:** No restrictions on grazing. Do not slaughter meat animals fed with treated forage or grazed on treated areas within 60 days after Banvel 10G application. **Cropping Restrictions:** In cultivated areas plant only spring wheat, barley or oats the following year. Yields of spring grains may be reduced in the first year of cropping.
14. TOXICITY: Low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = technical (1,700-2,900). May cause mild skin irritation and extreme eye irritation and swelling. Non-toxic to birds and fish.
15. PRECAUTIONS, FIRST AID: Avoid breathing dust. Wear standard protective clothing (see page 2) and gloves. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). Get medical attention. IF SWALLOWED - induce vomiting (see page 3). Get medical attention.
16. STORAGE: Store in a dry place. Freezing will not affect activity.

BASAGRAN (bentazon)  
BASF



1. FORMULATION: Solution - 480 g/L - 10 L pack.
2. REGISTERED MIXES: None
3. CROPS:

beans (dry (8.1), faba (8.6), snap (8.1))	corn (field, sweet)(8.8)	flax (8.8)	peas (canning(8.3), field (8.2))
Underseeding: Not recommended.			
4. WEEDS CONTROLLED:

buttercup	groundsel, common (8.5)	pigweed, redroot (6.8)	smartweeds, annual (7.0)
cocklebur	lamb's-quarters (6.2)	purslane	stinkweed (7.8)
chickweed, common (7.2)	mustard, wild (8.4)	ragweed, common	thistle (Canadian (4.7),
corn spurry (7.0)	nightshade, black (6.0)	shepherd's-purse (7.3)	Russian (7.9))
galinsoga, hairy			
5. WEEDS SUPPRESSED: Field bindweed.
6. WHEN USED: The best timing is 18-28 days after planting. Soybeans, most dry and snap common beans, and corn are tolerant at all growth stages. Peas can be treated with Basagran only after 3 pairs of leaves (or 3 nodes) are present. Fababeans may be treated with Basagran when the crop has 2-4 leaves, or is at least 10 cm tall. Flax may be treated with Basagran when it is 5 cm or taller.
7. HOW TO APPLY:

With: Ground or air.  
Rate: All crops 700-900 mL/ac. Add 810 mL/ac of Assist Oil Concentrate to increase performance. Do not use Assist on peas, use Cittowett Plus at 2.5 L/1000 L of spray solution.  
Water Volume: 80-160 L/ac - ground. 20-40 L/ac - air.  
Pressure: 275-400 kPa  
Nozzles: Do not use flood-jet nozzles.
8. SPRAYING TIPS: Best results when weeds young and actively growing. Reduce Assist rate to 400 mL/ac under hot humid conditions.
9. HOW IT WORKS: Contact herbicide which interferes with photosynthesis. In resistant plants, metabolized to a non-toxic material.
10. EXPECTED RESULTS: **Weeds:** Weeds turn yellow initially and then brown, usually within 2 weeks. **Crops:** Yellowing, bronzing, speckling, or burning occurs sometimes. The crop usually outgrows the condition within 10 days. **Poor results may be expected:** when weeds are beyond recommended growth stage; when spray coverage is poor; or under poor growing conditions.
11. EFFECTS OF RAINFALL: Rainfall within 6-8 hours of application may reduce activity.
12. MOVEMENT IN SOIL: Not applicable.
13. GRAZING AND CROPPING RESTRICTIONS: **Drift:** Avoid drift on to susceptible crops such as rapeseed and mustard.  
**Grazing Restrictions:** Do not feed green plants to livestock. **Succeeding Crops:** No restrictions.
14. TOXICITY: Low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = technical (850). Slightly toxic to fish; non-toxic to birds and bees.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - do NOT induce vomiting. See a doctor immediately.
16. STORAGE: Basagran should be stored in a heated place. However, freezing will not affect activity. If frozen, warm to room temperature and shake well.

**BENAZOLIN (benazolin)**  
Ciba-Geigy

1. FORMULATIONS: Solution 330 g/L - 4 L containers.
2. REGISTERED MIXES: None.
3. CROPS: Rapeseed (7.9). Underseeding: Not recommended.
4. WEEDS CONTROLLED: Wild mustard (7.8)
5. WEEDS SUPPRESSED: Canada thistle (3.7)
6. WHEN USED: Rapeseed: 3-5 true leaf stage; wild mustard: 2-4 leaves.
7. HOW TO APPLY:  
**With:** Aircraft or ground equipment.  
**Rate:** 600-850 mL/ac  
**Water Volume:** 22-40 L/ac  
**Pressure:** 275 kPa
8. SPRAYING TIPS: Remove all traces of herbicides from sprayer before spraying rapeseed - this is **absolutely essential**.
9. HOW IT WORKS: Not known.
10. EXPECTED RESULTS: Kill or suppress wild mustard.
11. EFFECTS OF RAINFALL: Do not spray if rain is expected within 4 hours.
12. MOVEMENT IN SOIL: Not applicable.
13. GRAZING AND CROPPING RESTRICTIONS: Avoid drift. No restrictions on grazing crop use after hail, or succeeding crops.
14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (3,000). May irritate skin and eyes. Not toxic to birds; slightly toxic to fish.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN - use standard first aid measures (see page 3). If irritation persists see a doctor. IF SWALLOWED - induce vomiting (see page 3). Get medical attention.
16. STORAGE: Heated storage is essential.

**BLADEX NINE-T (cyanazine)**  
Ciba-Geigy



1. FORMULATIONS: Dry Flowable 90%.
2. REGISTERED MIXES: With atrazine, Dual Ciba Geigy 960E, Eradicane, and Sutan+.
3. CROPS: Corn (field and sweet) (9.0).
4. WEEDS CONTROLLED:

barnyard grass	knotweed	pigweed (prostrate (6.7),	shepherd's-purse
buckwheat, wild	kochia	redroot (6.2)	smartweeds, annual
foxtail (green, yellow)(6.8)	lamb's-quarters	purslane	stork's-bill
goosefoot, oak-leaved	mustard (wild, wormseed)	ragweed (common, false)	thistle, Russian
5. WEEDS SUPPRESSED: None.
6. WHEN USED: Pre-plant incorporation on dryland, or pre-emergent followed in 5-7 days with irrigation. **NOTE:** Bladex Nine-T may be also applied early post-emergent.
7. HOW TO APPLY:  
**With:** Ground equipment.  
**Rate:** Preplant incorporation - 0.9-1.1 kg/ac. Pre-emergent - 1.0-1.2 kg/ac. Early post-emergent - 1.0 kg/ac. Use lower rates for light textured soils and higher rates for heavier soils.  
**Water Volume:** 60-80 L/ac.  
**Pressure:** 200-300 kPa.
8. SPRAYING TIPS:
  - (a) Do not use Bladex on soils with more than 70% sand or less than 1% organic matter.
  - (b) For early post-emergent application: add 1 L Bio-Veg T. M. crop oil/100 mL spray solution. Do not apply beyond the 3 leaf stage of corn (approx. 7.5 cm). Do NOT mix with any oils or adjuvants, other than Bio-Veg T.M. crop oil.
  - (c) A timely inter-row cultivation will control any seedling weeds which escape the treatment.
9. HOW IT WORKS: Active through root uptake, requires moisture to carry to root zone. Interferes with photosynthesis.
10. EXPECTED RESULTS: Weeds fail to emerge or die before reaching 2-3 leaf stage.
11. EFFECTS OF RAINFALL: Rainfall or irrigation required for activation. Heavy rainfall on very sandy soil may cause leaching and reduce effectiveness.
12. MOVEMENT IN SOIL: Negligible unless excess moisture on very sandy soil.
13. CROPPING AND GRAZING RESTRICTIONS: Where atrazine mix is used, corn should follow corn.
14. TOXICITY: Slightly high acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (334). Low toxicity to fish and birds.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical aid.
16. STORAGE: Not damaged by freezing. Store in a dry place.

BLADEX TTC (cyanazine)  
Ciba-Geigy



1. FORMULATIONS: Liquid - 480 g/L, 10 L containers.
2. REGISTERED MIXES: With Poast. **Mix Restrictions:** with agitator running add Bladex TTC to 1/2 the required amount of water, add water, then Poast, then Assist Oil Concentrate, then the remaining water.
3. CROPS: Triazine tolerant canola.
4. WEEDS CONTROLLED:

buckwheat, wild	hemp-nettle	pigweed, redroot	rapeseed (volunteer, non-triazine tolerant)
chickweed	lady's-thumb	shepherd's-purse	
cleavers	lamb's-quarters	smartweed, green	
groundsel, common	mustard, wild	stinkweed	
5. WEEDS SUPPRESSED: None.
6. WHEN USED: When crop and weeds are in 1-4 leaf stage.
7. HOW TO APPLY:

**With:** Ground equipment.  
**Rate:** Bladex TTC - 1.2 L/ac. Bladex TTC - 1.2 L/ac + Poast - 325-770 mL/ac.  
**Water Volume:** 40 L/ac  
**Pressure:** 275 kPa  
**Nozzles:** Flat fan, screens 50 mesh or larger. Do not use flood-jet or hollow cone nozzles.
8. SPRAYING TIPS:
  - (a) Optimum weed control is achieved when weeds are small and actively growing; later applications will be less effective.
  - (b) Tank mix with Poast.
9. HOW IT WORKS: Inhibits photosynthesis.
10. EFFECTS OF RAINFALL: Rainfall within 2 hours of application may reduce effectiveness.
11. MOVEMENT IN SOIL: Not applicable
12. CROPPING AND GRAZING RESTRICTIONS: No cropping restrictions.
13. TOXICITY: Slightly high acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (334). Low toxicity to fish and birds.
14. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical aid.
15. STORAGE: Not damaged by freezing. Store in a dry place.

**BLAGAL (cyanazine + MCPA-K)**  
Ciba-Geigy

1. FORMULATIONS: Suspension - 125 g/L of cyanazine and 250 g/L MCPA-K. 2 - 10 L jugs/pack.

2. REGISTERED MIXES: None.

3. CROPS: Spring wheat (8.7), barley (8.5), oats (9.0), flax (8.1).

Underseeding: Not recommended.

4. WEEDS CONTROLLED:

buckwheat	corn spurry (8.4)	mustard (ball, tumble, wild,	radish, wild
(Tartary (8.2), wild (7.2))	hemp-nettle (7.9)	wormseed)(8.7)	stinkweed (8.7)
chickweed (7.6)	lamb's-quarters (8.7)	pigweed, redroot (6.1)	MCPA-K susceptible weeds

5. WEEDS SUPPRESSED: Canada thistle, horsetail.

6. WHEN USED: Cereals, 2-5 leaf stage; flax, 5-10 cm high. Canada thistle, delay application until cereals have reached 5 leaf stage.

7. HOW TO APPLY:

With: Ground equipment.

Rate: 910 mL/ac

Water Volume: At least 40 L/ac

Nozzles: Do not use flooding tips. Flat fan, screens 50 mesh or larger.

Pressure: 200-300 kPa.

8. SPRAYING TIPS:

(a) Application after 5 leaf stage may cause serious crop injury and give poor weed control.

(b) Vigorous agitation necessary if the solution stands for several hours before spraying.

(c) Boom Angle: Direct spray straight down.

(d) Allow 4 days before or after wild oat herbicide application.

9. HOW IT WORKS: Cyanazine and MCPA-K act synergistically to disrupt metabolism and inhibit photosynthesis.

10. EXPECTED RESULTS: **Weeds:** Yellow blotches first appear in 5-10 days then the whole plant turns yellow and brown and dies. Young vigorously growing plants affected first. **Crop:** Under moisture or temperature stress, Blagal may cause temporary yellowing of lower leaves.

**Poor results may be expected if:** (a) Reduced application rate. (b) Poor penetration through dense crop canopy. (c) Extremely poor growing conditions (droughty). (d) Late application.

11. EFFECTS OF RAINFALL: Rain within 4 hours will seriously reduce activity.

12. MOVEMENT IN SOIL: Not applicable.

13. GRAZING AND CROPPING RESTRICTIONS: **Grazing restrictions:** Do not graze or feed green plants to livestock. **Crop use after hail:** Use if mature. **Succeeding crops:** No restrictions.

14. TOXICITY: Low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = Cyanazine (334), MCPA (700). Non-toxic to fish, birds and bees.

15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) to avoid contact with skin or eyes. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical attention.

16. STORAGE: Not damaged by freezing. Store in dry area and shake well before use. To re-suspend, warm and agitate.

**BUCTRIL M (bromoxynil + MCPA)**  
May and Baker



WARNING POISON

1. FORMULATIONS: Emulsifiable concentrate - bromoxynil 280 g/L + MCPA 280 g/L; 8L.
2. REGISTERED MIXES: Asulox F, Atrazine, Avenge, MCPA Ester or amine, TCA (barley, oats), Poast + Assist  
**Mix Restrictions:**
  - (a) With MCPA - with agitator running add Buctril M to 1/2 of the water then add rest of water and MCPA.
  - (b) With Avenge - As above, adding Avenge last.
  - (c) Add Asulox F or TCA to the prepared mix of Buctril M.
3. CROPS:
 

barley (8.8)	rye, fall	<b>seedling grasses (for seed)</b>
canary grass (8.5)	wheat, durum	bromegrass (8.9)
corn (field, sweet)(9.0)	wheat, winter (fall or spring applied) (8.6) spring	fescue (creeping red, meadow (8.3))
flax (8.4)		orchard grass (8.9)
oats (8.8)		Russian wild ryegrass (9.0)
- Underseeding: Not recommended
4. WEEDS CONTROLLED:
 

bluebur	flixweed	mustard (8.4)	shepherd's-purse
buckwheat	groundsel, common	(ball, tumble, wild, wormseed)	smartweeds, annual (8.2)
(Tartary, wild (8.1)	hemp-nettle*	night-flowering catchfly	stinkweed (8.9)
chamomile, scentless (7.6)	knawel	pigweed, redroot (7.9)	sunflower, volunteer
cocklebur	kochia (6.7)	ragweed, common	thistle, Russian (7.4)
cow cockle (7.8)	lamb's-quarters (8.6)	rapeseed, volunteer (8.7)	

\* Tank mix with MCPA preferred.
5. WEEDS SUPPRESSED: Canada thistle and perennial sow-thistle.
6. WHEN USED: Cereals - 2 leaf to early flag leaf. Winter wheat, fall rye - 2-4 leaf stage in the fall - after growth begins in spring to early flag leaf. Canary seed - 3-5 leaf. Flax - 5-10 cm. Buctril M (only) - 4-6 leaf on corn and 2-4 leaf on seedling grasses. Weeds - before 5 leaf stage.
7. HOW TO APPLY:
 

**With:** Ground equipment or air.

**Rate:** Buctril M: 400 mL/ac.

**Water Volume:** Ground Equipment: 20 or more L/ac. Air: 8 or more L/ac. Corn 80-120 L/ac.

**Pressure:** 275 kPa

**Nozzles:** No flood tips.
8. SPRAYING TIPS:
  - (a) Avoid spraying during a severe drought. Under conditions of high temperature and humidity, slight discolouration of cereals may occur but no effect on crop yields.
  - (b) Flax is less tolerant than cereals, therefore do not spray flax in hot humid weather when day time temperatures are over 25-29°C.
  - (c) Best results are achieved when weeds are sprayed in seedling stage, with good spray coverage.
  - (d) Corn: Buctril M at 400 mL/ac rate applied as an overall spray to corn in the 6 leaf stage. Buctril M at 400 mL/ac plus Atrazine at 450-910 g active/ac for broader spectrum weed control. Do not add oil or surfactant. Add Atrazine to the tank first. Observe precautions and limitations of both product labels. Cultivation after application is not recommended.
  - (e) Seedling Grasses (not underseeded to legumes in the year of establishment). Buctril M at 400 mL/ac rate may be applied in the 2-4 leaf stage in 60 L/ac of water.
9. HOW IT WORKS: Bromoxynil is a contact type herbicide, therefore, good spray coverage is essential. Inhibits photosynthesis and plant respiration. MCPA is absorbed through leaves and is readily translocated in the plant.
10. EXPECTED RESULTS: Small burnt spots on the leaf can appear within hours, complete death takes up to 2 weeks. **Poor results may be expected if:** Poor coverage. Poor penetration through crop canopy.
11. EFFECTS OF RAINFALL: No effect.
12. MOVEMENT IN SOIL: Not applicable.
13. GRAZING AND CROPPING RESTRICTIONS: No grazing or crop use restrictions.
14. TOXICITY: High mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (365). Very toxic to fish and birds; non-toxic to bees.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - Do NOT induce vomiting. Get medical attention.
16. STORAGE: Does not require heated storage.

**CALMIX (bromacil + 2,4-D)**  
Union Carbide

1. FORMULATIONS: Pellets, Bromacil - 3% + 2,4-D 5% - 1 and 5 kg.
2. REGISTERED MIXES: None.
3. CROPS: Non-crop land only.
4. WEEDS CONTROLLED: Non-selective.
5. WEEDS SUPPRESSED: Not applicable
6. WHEN USED: Calmix may be used in any season.
7. HOW TO APPLY:  
With: Calmix spreader or shaker.  
Rate: 2.5 kg/100 m<sup>2</sup> - annual weeds and perennial seedlings. 3.75 kg/100 m<sup>2</sup> - shallow-rooted perennials. 5.0 kg/100 m<sup>2</sup> - heavy perennial growth.  
(a) Apply at the higher rate to heavier soils and/or to extend the growth control period.  
(b) For spot treatment apply 375 g to about 1 m<sup>2</sup>. Repeat treatment when required.  
(c) For treatment around power poles, treat 1.25 m around each pole. Use about 250 g/pole.
8. SPRAYING TIPS:  
(a) Do not use near lawns or flower beds.  
(b) Do not apply closer than 1.5 times the height of nearby trees.
9. HOW IT WORKS: Systemic action, enters plant via roots.
10. EXPECTED RESULTS: Vegetation turns brown and dies. No new growth will appear, resulting in bare ground. Duration of control will depend upon amount of chemical applied, soil type and environmental conditions. **Poor results may be expected if:** Inadequate application rate. Soil erosion removes chemical from treated area when applied on slopes. Insufficient rainfall to activate chemical.
11. EFFECTS OF RAINFALL: Moisture will activate and carry the herbicide into the root zone.
12. MOVEMENT IN SOIL: Once fixed in the soil there is very little lateral movement. Pellets can be carried by erosion.
13. GRAZING AND CROPPING RESTRICTIONS: Not applicable.
14. TOXICITY: Low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = bromacil (5,200); 2,4-D (375). Slight toxicity to fish; non-toxic to birds.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) to avoid exposure to dust. IF IN EYES or ON SKIN - use standard first aid measures (see page 3).
16. STORAGE: Store in dry area.

**CARBYNE 2EC (barban)**

Velsicol



CAUTION POISON

1. FORMULATIONS: 240 g/L emulsifiable concentrate, 19 L container

2. REGISTERED MIXES: Carbyne 2EC + Avenge 200C (barley, spring and durum wheat).

## 3. CROPS:

alfalfa (8.7)	fababeans (8.7)	sugar beets (9.0)
barley (8.8)	flax (7.7)	sunflowers (8.6)
bromegrass, smooth (8.2)	lentils (8.4)	wheat, durum
canola (8.9)	mustard (8.9)	spring (8.9)
clover (alsike (8.9), red (9.0), sweet (6.0))	peas (field, processing (8.8))	
	ryegrass, Russian wild (8.1)	

<b>Seedling for Seed</b>
fescue, creeping red (8.9)
timothy (8.3)
wheatgrass, crested (8.6)

4. WEEDS CONTROLLED: Wild oats (6.6)

## 5. WHEN USED:

**Crop:**

Wheat (spring, durum), barley, lentils

**Stage:**

Before the 4-leaf stage or the 14th day after emergence whichever is first.

Canola, sugar beets, fababeans, sunflowers, mustard  
Flax

When the wild oats are in the 2-leaf stage.

**Peas**

Forages, legumes, grasses

After the 2 leaf stage but prior to the 12-leaf stage or before 14 days after emergence.

**Weed:**

Wild oats

Before the 6-leaf stage.

Before the 4-leaf stage.

When majority are in 2-leaf stage. Carbyne + Avenge: 3-4 leaf stage.

## 6. HOW TO APPLY:

**With:** Ground or Aircraft. Do no apply Carbyne + Avenge mix by air.**Rate:** 600-700 mL/ac on all crops. Use higher rate when the wild oat density is 50 plants/m<sup>2</sup> or more, or when wild oats are not actively growing, or when wild oats have been injured by frost or wind. Carbyne + Avenge 200C Mix 340 mL/ac, 800 mL/ac.**Water Volume:** *Ground:* 18 L/ac; *Aircraft:* 10-18 L/ac; **Carbyne + Avenge Mix:** (Ground only) 25-30 L/ac**Pressure:** 300 kPa (minimum)**Nozzles:** Tee Jet 650067, 730067, 800067; Delavan LF.67-65, LF.77-73, LF.67-80 Spray Jet 65.067, TK.75 or D.75.

## 7. SPRAYING TIPS:

(a) Wild oats seedlings will produce a new leaf every 5 days and under good growing conditions reach the 2-leaf stage 4-9 days after emergence. The degree of control is dependent upon the uniformity of emergence of the wild oats.

(b) There are no restrictions on applications of other pesticides after the Carbyne treatment; for the Carbyne + Avenge mix allow a 4 day interval between the application of this mix and the use of esters of bromoxynil, 2,4-D or MCPA.

(c) Do not apply when the crop is wet with dew or rain.

(d) Crop damage may occur if sprayed within 24 hours of frost.

8. HOW IT WORKS: A partially systemic herbicide: penetrates the leaf and stem surfaces of the wild oat plant, interfering with cell division.

9. EXPECTED RESULTS: Wild oat growth stops and leaves turn blue-green within 7-10 days. A swelling of the stem at ground level may occur. Leaf tips turn brown, the plant becomes brittle, dying 3-4 weeks after treatment.

10. EFFECT OF RAINFALL: Rainfall within 15 minutes after application may decrease control.

11. GRAZING AND CROPPING RESTRICTIONS: **Drift:** The hazard is low, however, common oats, buckwheat and rye can be seriously affected. **Grazing Restrictions:** Do not graze or feed crop for 5 weeks after treatment.12. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (2,750). Long-term exposure to this product has sensitized some people to it. Very toxic to fish.

13. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - Do NOT induce vomiting. Get medical attention.

14. STORAGE: May be stored at freezing temperatures but must be returned to its original state by warming to room temperature and agitating thoroughly.

**CASORON (dichlobenil)**

Pfizer

1. FORMULATIONS: Granular - 4% - 15 kg pack; 2.25 kg shaker jug.

2. REGISTERED MIXES: None

3. CROPS:

ash  
birch, cutleaf weeping  
caragana shelterbelts

cedar, white  
crabapple

fruit trees  
honeysuckle  
juniper  
maple

non-cropland  
raspberries  
willow

4. WEEDS CONTROLLED:

bindweed  
bluegrass, annual  
chickweed  
foxtail

groundsel  
horsetail  
knotweed  
lamb's-quarters

mustard  
pigweed  
purslane  
quackgrass

shepherd's-purse  
smartweed  
thistles

5. WEEDS SUPPRESSED: None.

6. WHEN USED: Apply on crops established for at least 1 season if perennial weed rates are used. Allow 4 weeks after transplanting tolerant crops for non-perennial rates.

7. HOW TO APPLY:

With: Ground granular applicator.

Rate: 45-70 kg/ac - based on area actually treated. 91-223 kg/ac - perennial weed control. Apply in late fall but before soil freeze-up or early spring. Do not use on light soil with less than 2% organic matter.

8. SPRAYING TIPS: Not applicable.

9. HOW IT WORKS: Snow melt or rain moves Casoron into the soil. Casoron inhibits germination but acts primarily on growing points and root tips.

10. EXPECTED RESULTS: Growth of emerging shoots of some perennials controlled. Tolerant crops are unaffected if roots do not come in contact with Casoron in the upper layers of the soil.

11. EFFECTS OF RAINFALL: If it is dry, poor results can be expected.

12. MOVEMENT IN SOIL: Some movement in coarse-textured soils.

13. GRAZING AND CROPPING RESTRICTIONS: Do not transplant into treated soil for 1 year.

14. TOXICITY: Very low mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (3,160). Slightly toxic to fish.

15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) to avoid skin and eye contact. IF IN EYES or ON SKIN - use standard first aid measures (see page 3).

16. STORAGE: Dry storage - not affected by frost.

CO-OP GRANULAR SOIL STERILANT  
Federated Co-operatives

1. FORMULATIONS: Dry granule - Sodium Metaborate Tetrahydrate 66.5%, Sodium Chlorate 30%; Diuron 1.25% - 1, 4 and 22.7 kg packs.
2. REGISTERED MIXES: None
3. CROPS: Use where long term, total vegetation control is desired.
4. WEEDS CONTROLLED: All growth.
5. WEEDS SUPPRESSED: Not applicable.
6. WHEN USED: Use in early spring when weeds are small or in fall when weeds are dormant.
7. HOW TO APPLY:  
**With:** Shaker can, mechanical spreader or knapsack sprayer.  
**Rate:** *Annual weeds:* 0.5-1 kg/10 m<sup>2</sup> - for dry application apply when rain is expected or water in. *Persistent perennial weeds:* 1-2 kg/10 m<sup>2</sup> - either at maturity of weed or on damp soil in spring. Use higher rates on deep rooted perennials.
8. SPRAYING TIPS:  
**Limitations**  
(a) Do not apply in hot, dry weather.  
(b) To avoid fire hazard from dead and dry vegetation, treat when weeds are small. If growth is well advanced, mow and rake before treatment. Do not apply on or near desirable plants or on areas into which their roots may extend, or in locations where the chemical may be washed or moved into contact with their roots.  
(c) Dried chemical residue on organic matter can be explosive.  
(d) Spray solution will damage leather.
9. HOW IT WORKS: Kills through contact action. Persists in the soil and provides prolonged control of germinating seedlings and re-growth from perennial roots. Length of control depends on: species, rate, soil type, rainfall, vegetation cover, and time of application.
10. EXPECTED RESULTS: Seedlings are controlled quickly. Slower kill on perennial weeds.
11. EFFECTS OF RAINFALL: Rainfall will move the chemical into the soil and enhance its activity; in areas of high rainfall or sandy soils, the residual effect is reduced due to leaching.
12. MOVEMENT IN SOIL: Limited.
13. GRAZING AND CROPPING RESTRICTIONS: Treated area will be rendered more or less unproductive for 1 or more years.
14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (2,300-3,500). May cause irritation of eyes, nose, throat and skin.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) and goggles. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical attention.
16. STORAGE: Store in cool, dry place. Avoid direct contact with ground or concrete floors when storing.



**CAUTION POISON**

## 1. FORMULATION: Emulsifiable concentrate - 2,4-D - 350 g/L + 2,4-DP - 350 g/L.

**2. REGISTERED MIXES: None**

3. CROPS: Non crop land, industrial areas, rights of way, roadsides.  
Underseeding - Not applicable.

#### 4. WEEDS CONTROLLED:

<b>Brush</b>		<b>Weeds</b>	
alder	honeysuckle	burdock	tansy
aspen	poplar	Canada thistle	toadflax
birch	sumac	curled dock	annual broadleaf weeds
buckbrush	wild cherry	perennial sow-thistle	
elderberry	willow		

**5. WEEDS SUPPRESSED:** None.

6. WHEN USED: Throughout growing season.

## 7. HOW TO APPLY:

**With:** Power equipment, knapsack sprayer, aircraft.

**Rate:** 8.5-11.0 L in 1000 L of water for foliage stem treatment. **Weeds:** 80-200 L/ac.

**Water Volume:** Spray to point of run-off. For fixed wing application - not less than 8 L/ac - water may be replaced by oil.

**Pressure:** As recommended for equipment used.

## 8 SPRAYING TIPS

(a) With agitator running, add herbicide to 1/2 carrier then add rest of carrier.

(b) If used in oil, do not let water get in mixture.

(c) Forms an emulsion in water – agitate to prevent separation.

#### 9 HOW IT WORKS: A translocated systemic herbicide absorbed by leaves

10. EXPECTED RESULTS: Leaves brown and wilt shortly after spraying - no leaves appear the following year.

11. EFFECTS OF RAINFALL: Rain within 3 or 4 hours after application may reduce control.

### 13. MOVEMENT IN SOIL : Not applicable

13. GRAZING AND CROPPING RESTRICTIONS: - no grazing restrictions. Drift over susceptible crops causes injury.

14. TOXICITY: Low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = 2,4-D (375); dichlorprop (875). 2,4-D present contains no dioxin.

15. PRECAUTIONS, FIRST AID: Do not apply when bees are foraging. Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - do NOT induce vomiting. Get medical attention.

16. STORAGE: If frozen, warm to 5°C and mix well.

**DUAL CIBA-GEIGY 960E (metolachlor)**  
Ciba-Geigy

1. FORMULATIONS: Emulsifiable concentrate - 960 g/L - 2 X 10 L pack, 1 X 110 L.
2. REGISTERED MIXES: May be applied as split application or tank mixed as follows. With Aatrex Liquid, Aatrex Nine-O, Bladex formulations, or Banvel, Kil-Mor and Estemine 2,4-D: split application only. Liquid nitrogen - 28% nitrogen solutions or complete liquid fertilizers may replace all or part of the water for pre-plant incorporated or pre-emergent application of Dual tank mixes in corn. Dry Bulk Granular Fertilizers - impregnate on fertilizer, soil apply, then incorporate to 5 cm.
3. CROPS: All corn and white beans.
4. WEEDS CONTROLLED: Barnyard grass, green and yellow foxtail plus weeds controlled by the second material in mix or oversprayed.
5. WEEDS SUPPRESSED: None.
6. WHEN USED: Pre-plant incorporated (PPI). Pre-emergent (PRE) under irrigation only.

7. HOW TO APPLY:

**With:** Ground equipment - band or overall spray.

**Rate:** Corn, white beans - 0.8-1.1 L/ac

Corn - Tank mixes of Dual Ciba-Geigy 960E at above rate.

Weeds Controlled	ppi*	Tank Mixes (Qty/ac)	Split Application
Annual grasses and broad-leaf weeds	+0.5-0.7 kg/ac	+0.5-0.7 kg/ha	+345-445 mL/ac
	Aatrex Nine-O or 0.9-1.3 L/ac	Aatrex Nine-O or 0.9-1.3 L/ac	Kilmor or 285-445 mL/ac
	Aatrex Liquid or 0.9-1.1 kg/ac	Aatrex Liquid or 0.8-1.0 kg/ac	Estemine 2,4-D
	Bladex Nine-T	Bladex Nine-T	

\* pre-plant incorporated; \*\* pre-emergence (under irrigation only); \*\*\* post emergence

**Water Volume:** 70-140 L/ac

**Incorporation:** Incorporate to 5 cm. Do not exceed this depth since product dilution can occur. If using tandem discs set to cut to a depth of 10 cm operated at 6-9 km/h. If using vibrating shank cultivators with overlapping sweeps, set 10 cm deep and operate at 10-13 km/h. Spike tooth or diamond tooth harrows are good incorporation equipment. Immediate incorporation is not necessary although desirable.

**Pressure:** 200-300 kPa

8. SPRAYING TIPS:

(a) Do not tank mix with Kil-Mor or Estemine.

(b) For band treatments, use a press wheel ahead of the nozzle to level the band.

(c) Do not impregnate on nitrate fertilizers (ammonium, potassium, sodium, calcium) or on single superphosphate (0-26-0), triple superphosphate (0-46-0) or on ammonium phosphate or on limestone. Fertilizer blends containing limestone may be impregnated.

9. HOW IT WORKS: Inhibits germination, particularly grasses.

10. EXPECTED RESULTS: Annual grasses do not germinate or under dry conditions may die back soon after emergence.

11. EFFECTS OF RAINFALL: Moisture required to move chemical to area of germination but an excess may move it below this area.

12. MOVEMENT IN SOIL: Some movement may occur if excess moisture or light soil.

13. CROPPING AND GRAZING RESTRICTIONS: Do not apply on muck, peat or high organic soils, or after growth has begun. Winter cereals may be seeded 4.5 months after treatment.

14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (2,780). Prolonged exposure may cause eye injury. Slightly toxic to birds; non-toxic to fish.

15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - do NOT induce vomiting. Get medical attention.

DYCLEER (dicamba)

Velsicol



WARNING POISON

1. FORMULATIONS: DyCleer - 400 g/L dicamba DMA, 10 L; 480 g/L dicamba DMA, 9.5 L. DyCleer 24 - 200 g/L dicamba DMA + 400 g/L 2,4-D amine, 10 L.  
**The 480 g/L formulation is being introduced in 1986. Rates shown below refer ONLY to 480 g/L formulation.**
2. REGISTERED MIXES: DyCleer + 2,4-D (amine or L.V. ester) Mixing with other pesticides: Not recommended.
3. REGISTERED USES: Non-cropland use for control of broad-leaf weeds and brush.
4. VEGETATION CONTROLLED: Deciduous, coniferous brush species; hard to kill annual and perennial weed species.
5. WHEN USED: **Deciduous species:** when leaves are fully expanded in June. **Coniferous species:** apply in June. **Broad-leaf weeds:** when actively growing, normally between May and July.
6. HOW TO APPLY:  
**With:** Conventional boom sprayer, a handgun or boomless type sprayer. Thorough coverage essential.  
**Rate:** 480 g/L formulation  
**Brush:**  
(a) Snowberry, wolf willow, aspen poplar, alder, wild rose: 2.1 L DyCleer plus 4 L of 2,4-D amine or L.V. ester 500 in 1000 L water, or 5.0 L DyCleer 24 in 1000 L water.  
(b) Balsam poplar, birch, black cottonwood, spruce, pine, balsam fir, tamarack: 4.0 L DyCleer + 8 L of 2,4-D amine or L.V. ester 500 in 1000 L water or 10 L DyCleer 24 in 1000 L water.  
**Weeds:**  
(a) Top growth of absinthe, Canada thistle, perennial sow thistle, leafy spurge, poverty weed, scentless Mayweed: 0.5 L/ac DyCleer or 1.1 L/ac DyCleer 24.  
(b) Perennial sow-thistle, ragweed, goldenrod, tansy ragwort, Canada thistle, field bindweed, and top growth of curled dock: 0.93 L/ac DyCleer or 2.2 L/ac DyCleer 24.  
(c) Diffuse knapweed, goat's-beard, ground cherry, pasture sage, poverty weed: 1.9 L/ac DyCleer or 4.5 L/ac DyCleer 24.  
(d) Baby's breath, fringed sage brush, and top growth control of cinquefoil and Russian knapweed: 3.7 L/ac DyCleer.  
(e) For control of a broader range of weeds, the recommended rate of DyCleer may be tank mixed with 2,4-D Amine or Ester.  
**Turf:**  
Clover, mouse-eared chickweed, erect knotweed: 0.5 L/ac DyCleer. For control of a broader range of weeds tank mix 0.90 L/ac 2,4-D Amine 500 or 0.81 L/ac 2,4-D Ester 600.  
**Water Volume:** Apply only in water for deciduous and coniferous brush. Rate/ 1000 L of water applied to point of run-off. For broad-leaf weed control: 45-90 L/ac. For turf: 45 L/ac.
7. SPRAY TIPS:  
(a) Thorough coverage of weed and wetting brush to the point of run-off is essential for control.  
(b) Brush and trees over 2 m should be cut and regrowth sprayed.  
(c) Do not mix with oils.  
(d) A tank mix of DyCleer with 2,4-D L.V. Ester may improve brush control, especially under drought stress.
8. HOW IT WORKS: Dicamba is a systemic herbicide that is absorbed through roots or leaves and translocated in most plants. Disrupts the metabolic and growth activities in the plant.
9. EXPECTED RESULTS: Excellent control of brush can be expected within a year of application. Effect on broad-leaf weeds may be seen in 10-14 days resulting in twisting and bending of the main stem, cupping of leaves, increase in root size and stimulation of fibrous root production. **Precautions that should be followed:** (a) Avoid applications if temperatures exceed 30°C to reduce risk of vapour drift. (b) Avoid applications onto soil over the root systems of desirable trees and shrubs.  
(c) Thoroughly clean application equipment after use.
10. EFFECTS OF RAINFALL: Rainfall 4 hours after application will not reduce effectiveness.
11. MOVEMENT IN SOIL: Very little can leach downward.
12. GRAZING AND CROPPING RESTRICTIONS: Not applicable.
13. TOXICITY: Low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = dicamba DMA salt (2,600). Low toxicity to fish; non-toxic to bees.
14. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) to reduce exposure. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical attention.
15. STORAGE: Freezing may cause crystallization but no activity is lost if completely resuspended.

DYVEL (dicamba + MCPA-K)  
Velsicol



WARNING POISON

1. FORMULATIONS: Water soluble solution 84 g/L dicamba and 336 g/L MCPA potassium salt; 10 L containers.
2. REGISTERED MIXES: None
3. CROPS: Barley (8.6), oats (9.0), spring wheat (8.7), winter wheat. Underseeding: Legume underseeding not recommended.
4. WEEDS CONTROLLED:

buckwheat	flixweed	mustard (8.8)	ragweed (common, giant, false)
(Tartary, wild (7.1))	hemp-nettle (6.5)	(wild, ball, tumble, Indian, hare's ear, wormseed)	shepherd's-purse
burdock	kochia	pigweed (prostrate, redroot (8.8), Russian)	smartweed, green (7.7)
corn spurry (5.6)	lady's thumb	radish, wild	stinkweed (8.4)
cocklebur	lamb's-quarters (8.6)		sunflower, volunteer thistle, Russian (7.0)
cow cockle			
5. WEEDS SUPPRESSED: Canada thistle (6.8), sow-thistle, cleavers.
6. WHEN USED: 2-5 leaf stage for spring wheat, barley and oats. For winter wheat apply in spring when wheat is 15-25 cm tall or before shot blade stage. Best results will be obtained on hemp-nettle, corn spurry and cow cockle if application is made at the 2-3 leaf stage of the weeds.
7. HOW TO APPLY:

With: Ground or air.  
Rate: 510 mL/ac  
Water Volume: Ground - 45 L/ac. Air - not less than 8 L/ac.  
Pressure: Ground - 275 kPa. Air - not above 200 kPa.
8. SPRAYING TIPS:
  - (a) Do not spray if rain is expected within 4 hours of application.
  - (b) Best under good growing conditions and air temperature 10-25°C.
  - (c) Avoid application if frost or severe drop in night temperature is forecast.
  - (d) Avoid application when crop is under stress from disease or adverse environmental conditions.
  - (e) Crop damage can occur if the chemical is applied at any time other than the recommended crop stage.
  - (f) Shortening of straw may occur without loss in yield.
9. HOW IT WORKS: DyVel is a systemic herbicide that is absorbed through the roots and leaves and translocated readily.
10. EXPECTED RESULTS: **Weeds:** Twisting, bending of main stem and leaf petioles, cupping of leaves or increase in root size occur within 10-14 days. **Poor results may be expected if:** it rains within 4 hours of application, or when older weeds are sprayed, or if less than recommended water volume is used.
11. EFFECTS OF RAINFALL: Rainfall 4 hours after application will not reduce effectiveness.
12. MOVEMENT IN SOIL: Not applicable.
13. GRAZING AND CROPPING RESTRICTIONS: Do not graze or harvest for livestock feed prior to crop maturity.
14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = dicamba (1,707-2,900), MCPA (700). Non-toxic to birds, fish and bees.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) to cut down on exposure. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). May cause some swelling to eyes. IF SWALLOWED - induce vomiting (see page 3). Get medical attention.
16. STORAGE: Protect from freezing but if frozen no activity is lost if completely resuspended.

2,4-D  
Numerous manufacturers



WARNING POISON

1. FORMULATIONS: 2,4-D low volatile ester - 500, 600, 700 g/L; 2,4-D amine - 500 g/L. 10 L, 20 L containers. Driamine - 2,4-D 80% Soluble Granule

2. REGISTERED MIXES: 2,4-D + atrazine and related triazines, bromoxynil, dalapon, dicamba, picloram, sodium TCA; 2,4-D ester + Avenge 200C, Stampede 360 on spring and durum wheat. Some formulations can be mixed with liquid fertilizer (28-0-0)

3. CROPS: Asparagus, barley (9.0), corn, flax, grasses (seeded, established), grass pasture, rye, turf, wheat (spring) (8.7), wheat (winter) (9.0).

4. WEEDS CONTROLLED: **NOTE:** First rating amine; second rating ester.

bluebur	pigweed (prostrate, Russian) (7.0)	<b>Hard to Kill Weeds:</b>	<b>Top Growth Control:</b>
burdock	plantain	bindweed (hedge)	bindweed (field)
cocklebur	prickly lettuce	dandelion	blue lettuce
clover, sweet	purslane	docks	Canada thistle
flixweed (7.8)(7.8)	radish (wild)	gumweed	field horsetail
goat's-beard	ragweeds	hairy galinsoga	leafy spurge
kochia (5.7)(6.8)	shepherd's-purse (8.6)(8.0)	mustard, dog	pigweed, redroot
lamb's-quarters (7.7)(8.0)	sow-thistle (annual)	oak-leaved goosefoot	sow-thistle, perennial
mustard (8.0)(8.0)	stinkweed (8.1)(8.0)		
(except dog, green tansy)	sunflower, annual		
peppergrass (common)	vetch		

5. WEEDS SUPPRESSED: Peppergrass (field), pineapple weed, Russian thistle, wormwood (biennial).

6. WHEN USED: **Wheat, Barley, Rye:** 3 leaf to just before flag leaf. **Flax (linseed) (Amine only):** 5 cm to before bud stage.

**Corn (Amine only):** Emergence to 15 cm tall. Use drop nozzles to keep spray off foliage. **Grass pasture and turf:**

Seedling weeds. **Asparagus (Amine only):** Cultivate, then apply before first spears. Could repeat after harvest. **Brome and fescue grown for seed (Amine only)** not in seedling year, prior to shot blade and no more than 0.9 L/ac.

7. HOW TO APPLY:

**With:** Aircraft or ground equipment

**Rate:**

**FORMULATION AND CONCENTRATION (Qty/ac)**

Crop	Amine 500	Ester 500	Ester 600	Ester 700
Wheat	280-450 mL	280-710 mL	240-610 mL	160-510 mL
Barley, rye	510-730* mL	510-730* mL	510-730* mL	510-730* mL
Flax	280-450 mL	Not Recommended	-	-
Corn at emergence	220-450 mL	Not Recommended		
post-emergence	610 mL	Not Recommended		
Established grass	450-810 mL	610-710 mL	340-610 mL	-
Grass pasture, turf	610 mL-1.7 L	810 mL-1.4 L	610 mL-1.1 L	610 mL-1.0 L
Asparagus	1.4 L	Not Recommended	Not Recommended	Not Recommended

For registered mixes of 2,4-D Ester 500 with Avenge 200C - use up to 450 mL/ac of 2,4-D Ester 500 with 1.4-1.7 L/ac of Avenge 200C. With Stampede 360 use on spring and durum wheat only, use 1100 mL/ac Stampede 360 + 320-490 mL/ac 2,4-D Ester 500 OR 1100 mL/ac Stampede 360 + 490 mL/ac 2,4-D amine 500.

\* **NOTE:** Higher rates can be used if weed infestation is high, but some crop injury may occur.

**Water Volume:** Aircraft: minimum 8 L/ac. Ground: Wheat, barley, rye, oats, corn - 40 L/ac; Flax (linseed) - minimum 40 L/ac of water; Grass Pastures and Turf - 160 L/ac for thorough coverage.

**Pressure:** 275 kPa

8. SPRAYING TIPS: Spray during warm weather when the weeds are young and growing actively. At high temperatures vapourization of more volatile esters may cause injury to susceptible plants.

9. HOW IT WORKS: This hormone type herbicide causes abnormal growth, and affects respiration, food reserves and cell division in broadleafed plants. Absorbed primarily by leaves and stems and translocated to the growing tips and roots.

10. EXPECTED RESULTS: Susceptible plants become malformed before they die.

11. EFFECTS OF RAINFALL: A rain free period of 2 hours for esters, 4 hours for amine and 6 hours for salts.

12. MOVEMENT IN SOIL: Leaching does not pose a problem.

13. GRAZING AND CROPPING RESTRICTIONS: Do not use on bent grasses or on freshly seeded turf.

14. TOXICITY: Moderate acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (300-1,000). Some formulations may cause skin irritation. Some formulations are toxic to fish and should not be introduced into aquatic environments.

15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) and goggles. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF AMINE FORMULATIONS SWALLOWED - induce vomiting (see page 3). IF ESTER FORMULATIONS SWALLOWED - do NOT induce vomiting. In all cases, get medical attention.

16. STORAGE: Do not freeze amine, if frozen warm to 4°C and mix thoroughly before using.

2,4-D (Industrial)

Dow



1. FORMULATIONS: Low volatile ester - 564 g/L in 20 L pails.
2. REGISTERED MIXES: Mixing restrictions: Diesel oil, No. 2 fuel oil, kerosene, or water can be used as a carrier. With agitator running add 1/3 of the carrier, add herbicide then the remainder of the carrier. When using oil carriers do not allow water to get into product or spray tank. (Oil mixes are very expensive, use may be limited to small areas, during dormant season.)
3. CROPS: Industrial and forestry locations. To control unwanted vegetation.
4. WEEDS CONTROLLED: Alder, balsam, poplar, trembling aspen, birch, elm, cherry, hazelnut, sumac, Manitoba maple, willow, and common broadleaf weeds.
5. WEEDS SUPPRESSED: Canada thistle, field bindweed.
6. WHEN USED: *Foliar treatment*: after foliage is fully developed. *Stump treatment*: On freshly cut stump any time including winter. *Basal Bark Treatment*: Any time. Do not cut for 1 year after application.
7. HOW TO APPLY:  
**With:** Aircraft or ground equipment.  
**Rates:** *Foliar treatment*: 8 L in 1000 L of water, *Stump treatment*: 30 L in 1000 L of diesel fuel, *Basal bark treatment*: 20-30 L in 1000 L of diesel fuel.  
**Aircraft:** Apply above proportions in a minimum of 12 L/ac.  
**Pressure:** Ground - up to 1700 kPa. Aircraft - 235 kPa.
8. SPRAYING TIPS:
  - (a) Spray during warm weather when weeds and brush are actively growing.
  - (b) Continuous agitation is required for the oil-water mixture.
  - (c) Do not apply by air in dead-calm conditions as the "cloud" of suspended droplets may drift when wind comes up.
9. HOW IT WORKS: Absorbed through leaves and bark in trees. A hormone type herbicide causing an abnormal growth.
10. EXPECTED RESULTS: Brown crisp leaves first appear then complete death.
11. EFFECTS OF RAINFALL: A rain free period of 4-6 hours.
12. MOVEMENT IN SOIL: Minimal soil movement. 30 day half-life.
13. GRAZING AND CROPPING RESTRICTIONS: Use only on established turf grasses except creeping grasses such as bentgrass. Avoid spray drift.
14. TOXICITY: High acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (300-1,000). Some formulations may cause skin irritation. Toxic to fish and should not be introduced into aquatic environments.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) and goggles to reduce exposure. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - do NOT induce vomiting; see a doctor immediately.
16. STORAGE: Store away from fertilizers, seeds, insecticides, fungicides or other herbicides intended for use on 2,4-D sensitive crops. If frozen, bring to room temperature before using.



1. FORMULATIONS: Emulsifiable concentrate 400 g/L, 4 and 20 L. Embutox - 8 L, Embutox 625 - 625 g/L - 8 L.
2. REGISTERED MIXES: Embutox + Asulox F (alfalfa only) Embutox + MCPA (sodium and K Salts); Cobutox 400 + MCPA amine; 2,4-D Butyric 400 + MCPA. **Mix Restrictions:** Add Embutox to the Asulox F already pre-mixed in the spray tank.
3. CROPS: Alfalfa (8.0), bird's-foot trefoil, white and alsike clovers (8.9), seedling stage of legumes only - spring wheat (8.8), barley (9.0), oats (8.2), field corn, pastures (9.0).

4. WEEDS CONTROLLED:

buckwheat, wild (5.7)	mustard (ball, wild*)	ragweed	stinkweed
cocklebur	wormseed) (5.8)	redroot pigweed	thistle, bull
curled dock (8.0)	narrow-leaved hawk's-beard*	shepherd's-purse	yellow rocket
lamb's-quarters (8.4)	oak-leaved goosefoot	smartweeds, annual (5.4)	
	plantain		

\* For better control use Embutox + MCPA or 2,4-D Butyric 400 + MCPA.

5. WEEDS SUPPRESSED: Canada thistle, field bindweed, perennial sow-thistle, dandelion and horsetail.

6. WHEN USED: Weeds - 1-3 leaf (seedling) stage. Seedling alfalfa, bird's-foot trefoil - 1-4 trifoliate leaf. Seedling white, alsike clover - after the first trifoliate leaf. Cereals - 5th leaf to the early flag leaf. Field corn - after crop is 38 cm high but before the beginning of tasselling. Pastures - after cutting or grazing, and before regrowth is 7.5 cm high.

7. HOW TO APPLY:

With: Ground equipment

Rate: 1.0-1.7 L/ac. Embutox 625 - 0.7-1.1 L/ac.

Water Volume: 60-80 L/ac

Pressure: 275 kPa

8. SPRAYING TIPS:

(a) Do not spray in drought conditions.

(b) Damage to forage legumes (especially to established alfalfa) may occur and increase in severity the longer treatment is delayed beyond stage recommended.

(c) Oats are sensitive if treated before the 5 leaf stage.

(d) For control of narrow-leaved hawk's-beard\*, with Cobutox 400 apply 3.5 L/ac to rosettes in the fall after legume growth has ceased. For better wild mustard control - tank mix Embutox or Cobutox 400 with MCPA salt/ac use on seedling alfalfa and bird's-foot trefoil - some crop stunting may occur.

9. HOW IT WORKS: Susceptible plants convert 2,4-DB to 2,4-D. Certain legumes do not convert it. 2,4-DB is translocated to actively growing parts.

10. EXPECTED RESULTS: Weeds should die within 2-3 weeks of treatment.

11. EFFECTS OF RAINFALL: Rainfall before the foliage has dried from the spraying may decrease activity.

12. MOVEMENT IN SOIL: Not applicable.

13. GRAZING AND CROPPING RESTRICTIONS: No grazing restrictions.

14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (1,960). Toxic to fish; non-toxic to birds and bees.

15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - do NOT induce vomiting. Get medical attention.

16. STORAGE: If Embutox or Cobutox 400 freezes it can be reactivated by warming to 20-22°C and agitating thoroughly. Do not freeze 2,4-D Butyric 400. Embutox 625 does not require heated storage.

**EPTAM (EPTC)**

Chipman

**CAUTION POISON**

1. FORMULATIONS: Emulsifiable concentrate 800 g/L (Eptam 8-E), 20 L container. Granular (Eptam 10-G), 20 kg bag.
2. REGISTERED MIXES: Eptam 8-E + liquid fertilizer Eptam 8-E + granular fertilizer (except for nitrate based fertilizer) Eptam 8-E + Lexone or Sencor (Irish potatoes)
3. CROPS: Alfalfa (9.0), bird's foot trefoil, dry beans (7.6), snap beans (8.6), flax (7.5), Irish potatoes (9.0), sunflowers (7.9), turnips (rutabagas) (8.0), sugar beets (8.3). Underseeding: Not recommended.
4. WEEDS CONTROLLED:
 

barley, volunteer (8.6)	foxtail, green (7.7)	nutsedge, yellow	quackgrass
barnyard grass (8.6)	foxtail, yellow (8.4)	oats (volunteer, wild (8.1))	ryegrass (8.4)
bluegrass, annual (7.2)	hairy nightshade (8.5)	pigweed (prostrate, redroot (6.3), tumble)	wheat, volunteer (6.9)
chickweed, common	henbit	purslane	witchgrass
corn spurry (9.0)	lamb's-quarters (6.4)		
5. WEEDS SUPPRESSED: None
6. WHEN USED: **Alfalfa and Bird's-foot Trefoil (New Seedlings)** – Just prior to planting. Do not use if seeding a grain or grass nurse crop. **Beans, Snap or Dry (including Red Kidney Beans)** – Just prior to planting – Do not use on Adzuki beans, cow peas, soybeans, lima beans or other flat podded beans except Romano. **Flax, Sunflower (Spring)** – Just prior to planting. Do not apply in the spring on soils with less than 3% organic matter. **Flax, Sunflower (Fall)** – Just prior to freeze-up. The following spring, just prior to seeding, cultivate lightly to destroy any overwintering rosettes. **Potatoes** – Incorporate in the fall or spring, after drag-off, or just prior to the last cultivation. Eptam 8-E can also be metered into irrigation equipment (see label for exact and detailed instructions). Do not apply within 45 days of harvest. **Turnips** – Apply and incorporate 6-10 days prior to planting. **NOTE:** Fall application should not be used in areas where soil drifting is a hazard.
7. HOW TO APPLY:
 

With: Ground equipment or irrigation water.

**Rate:** **Alfalfa and Bird's-foot Trefoil:** 1.7 L/ac or 13.8 kg/ac of Eptam 10-G.

**Snap or Dry Beans:** 1.7-2.2 L/ac or 13.8-18.2 kg/ac of Eptam 10-G. **Flax:** Spring Treatment – Light soil 1.4 L/ac or 11.3 kg/ac Eptam 10-G. – Heavy soil 1.7 L/ac or 13.8 kg/ac Eptam 10-G., Fall Treatment – Light soil 1.7 L/ac or 13.8 kg/ac Eptam 10-G. – Heavy soil 2.2 L/ac or 18.2 kg/ac Eptam 10-G.

**Special Instructions for Flax:** Seed shallow, less than 3 cm, into a firm seedbed. Deep seeding reduces stands.

**Potatoes:** Before Planting, Drag-off – 1.7-3.4 L/ac or 13.8-27 kg/ac Eptam 10-G. Post emergence – 1.7-2.2 L/ac or 13.8-18.2 kg/ac Eptam 10-G. Sprinkler Irrigation – 1.7-2.3 L/ac Fall Treatment – 2.3-3.4 L/ac **Sunflowers:** Spring 1.7 L/ac or 13.8 kg/ac Eptam 10-G. Fall – 1.7-2.2 L/ac or 13.8-18.2 kg/ac Eptam 10-G. **Turnips:** Sandy soil 1.3 L/ac or 9.1 kg/ac Eptam 10-G – Heavy soil 1.7 L/ac or 13.8 kg/ac Eptam 10-G

**Water Volume:** 45 L/ac

**Incorporation:** Eptam 8-E or 10-G should be incorporated immediately. If using power-driven cultivation equipment, set the implement to cut 5-7.5 cm deep. **Tandem and One Way Discs** – Set to cut 10-15 cm and operate at 6.5-9.5 km/h followed by harrows. Incorporation should be done twice in 2 different directions. **Field Cultivators** – for lighter soils in good tilth. Use 3-4 rows of sweeps spaced no wider than 18 cm. Cut 10-15 cm deep at 9.5 km/h. The second incorporation must be made at a right angle to the first. Harrows should be pulled behind the cultivator.

**Pressure:** 275 kPa approximately 40 L/ac.
8. SPRAYING TIPS: When applying Eptam 8-E with granular fertilizer, a minimum of 81 kg/ac and a maximum of 324 kg/ac of fertilizer is required. See product label for further instructions.
9. HOW IT WORKS: Eptam is taken up by the roots and shoots of a germinating weed where it disrupts and stops further growth.
10. EXPECTED RESULTS: **Weeds:** Since Eptam is absorbed by the weed shoot, most affected weeds will not emerge. Numerous chlorotic and bleached shoots may be visible by removing the top few inches of treated soil. It should provide effective weed control for approximately 6-8 weeks. **Crops:** If crop seedlings are weak, some injury may occur.
11. EFFECTS OF RAINFALL: Very soluble in water so excessive moisture may cause leaching.
12. MOVEMENT IN SOIL: Eptam will move readily in the soil.
13. GRAZING AND CROPPING RESTRICTIONS: None. **Crop Use After Hail:** No restrictions. **Succeeding Crops:** No restrictions.
14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (1,600). Very toxic to fish; non-toxic to birds.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN – use standard first aid measures (see page 3). IF SWALLOWED – do NOT induce vomiting. Get medical attention.
16. STORAGE: Heated storage not required. Store away from seed and fertilizer.

**ERADICANE 8-E (EPTC + R25788)**

Chipman



CAUTION POISON

1. FORMULATIONS: Emulsifiable concentrate - 800 g/L, 20L.
2. REGISTERED MIXES: With Atrazine (80W or F), liquid fertilizer, granular fertilizer, urea and urea blends. Mix restrictions - check compatibility.
3. CROPS: Corn (field, sweet) (9.0)

**4. WEEDS CONTROLLED:**

barley, volunteer (7.0)	corn spurry	nightshade, hairy	purslane
barnyard grass (8.7)	foxtail (green (8.4), yellow)	oats (volunteer, wild) (8.1)	quackgrass
bluegrass, annual	henbit	pigweed (prostrate, redroot, tumble) (6.6)	ryegrass, volunteer
common chickweed	lamb's-quarters (9.0)		wheat, volunteer (9.0)

**5. WEEDS SUPPRESSED: None.****6. WHEN USED: Apply and incorporate and seed corn as soon as possible.****7. HOW TO APPLY:****With:** Ground equipment**Rate:** Field and silage corn - 1.7-3.4 L/ac, Sweet corn - 1.7-2.2 L/ac (Annual weed control)**Water Volume:** 45 L/ac**Incorporation:** Within minutes of application. Use power-driven cultivation equipment, set to cut 5-7.5 cm deep or discs set 10-15 cm - both these types of equipment should operate at 6.5-9.5 km/h. A second working, at right angles to the first will provide adequate mixing.**Pressure:** 275 kPa**8. SPRAYING TIPS: Proper soil coverage and immediate and adequate soil mixing are important.****9. HOW IT WORKS: Absorbed by roots and shoots of a germinating weed, disrupts and stops growth and causes eventual death.****10. EXPECTED RESULTS: *Weeds:* Affected weeds do not emerge, chlorotic and bleached shoots are visible by removing a layer of treated soil. *Crops:* Weak seedlings may be injured. *Poor results may be expected if:* soils are wet, cloddy and trashy; not suitable for proper application or incorporation.****11. EFFECTS OF RAINFALL: Very soluble therefore, excessive moisture may cause leaching.****12. MOVEMENT IN SOIL: Will move readily.****13. GRAZING AND CROPPING RESTRICTIONS: No restrictions on grazing, crop use after hail nor on succeeding crops. Danger from drift is low. **Caution:** Excessive incorporation required may cause erosion on some soil.****14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (1,600).****15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - do NOT induce vomiting. Get medical attention immediately.****16. STORAGE: Heated storage not required.**

## ERAMOX (atrazine + simazine)

Ciba-Geigy

1. FORMULATIONS: Wettable powder - 40% atrazine + 40% simazine - 25 kg packs
2. REGISTERED MIXES: None
3. CROPS: Total weed control and bare ground maintenance on non-crop land.
4. WEEDS CONTROLLED: Most growth. Milkweed and horsetail require more than 1 treatment.
5. WEEDS SUPPRESSED: Not applicable
6. WHEN USED: April and May OR August to freeze-up **NOTE:** Spring applications should be extended for a further month only if rainfall and soil moisture are plentiful, and top kill chemical is used.
7. HOW TO APPLY:  
With: Ground or small hand equipment.  
Rate: 5.75-11.5 kg/ac  
Water Volume:  
Incorporation: See "Soil Sterilants" page 4.
8. SPRAYING TIPS: See "Soil Sterilants" page 4.
9. HOW IT WORKS: Eramox is a formulation of 2 triazines that are taken up mainly by roots but may also be absorbed through foliage.
10. EXPECTED RESULTS: Weeds either do not emerge or die back soon after emergence.
11. EFFECTS OF RAINFALL: Average rainfall enhances performance. Very heavy rainfall on sandy soils can lead chemical from target area and a decrease in efficacy.
12. MOVEMENT IN SOIL: Low solubility, and low leachability, but there may be some physical movement on sloping ground.
13. GRAZING AND CROPPING RESTRICTIONS: Not applicable.
14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = 80W atrazine (3,000), 80W simazine (5,000). May cause dermatitis after prolonged exposure. Non-toxic to fish and birds, but it may be toxic to bees.
15. PRECAUTIONS, FIRST AID: Do not spray on foraging bees. Wear standard protective clothing (see page 2) to prevent exposure. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical attention.
16. STORAGE: Store in dry area, heating not required.

**ESTAPROP (2,4-D + dichlorprop)**

May and Baker



WARNING POISON

1. FORMULATIONS: Emulsifiable concentrate - 2,4-D - 282 g/L + dichlorprop - 300 g/L - 8 L.
2. REGISTERED MIXES: With Avenge.
3. CROPS: Spring wheat (8.2), winter wheat (9.0), barley (8.1). Underseeding - to legumes not recommended.
4. WEEDS CONTROLLED:

bluebur (9.0)	goosefoot, oak-leaved	pigweed, redroot	sow-thistle, annual
buckwheat	kochia (7.5)	pigweed, Russian	sunflower, volunteer
(Tartary, wild (7.4))	lamb's-quarters (7.8)	ragweed	stinkweed (9.0)
catchfly, night-flowering	mallow, round-leaved	rapeseed, volunteer	stork's bill (6.9)
cocklebur	mustard (ball, dog, wild,	shepherd's-purse	thistle, Russian
flixweed	Indian, tumble, hare's ear,	smartweeds, annual (7.8)	
	wormseed)(8.6)		
5. WEEDS SUPPRESSED: Canada thistle (5.6), curled dock, perennial sow-thistle.
6. WHEN USED: Spring seeded crops - 4 leaf to flagleaf. Fall seeded crops - full tillering to flag leaf, applied in the spring. Early spraying of stork's bill, round leaved mallow and kochia gives good control.
7. HOW TO APPLY:  
**With:** Ground or air.  
**Rate:** 710 mL/ac  
**Water Volume:** 20-80 L/ac  
**Pressure:** 275 kPa
8. SPRAYING TIPS: None specified.
9. HOW IT WORKS: A systemic herbicide absorbed by leaf and stem.
10. EXPECTED RESULTS: Twisting and curling of weeds will commence 2-10 days after application. Growth ceases, eventually plants turn brown and die. **Poor results may be expected if:** (a) Poor coverage. (b) Low relative humidity during and after spraying.
11. EFFECTS OF RAINFALL: No information available.
12. MOVEMENT IN SOIL: Not applicable.
13. GRAZING AND CROPPING RESTRICTIONS: Drift over susceptible crops will cause injury. No grazing until 14 days after application.
14. TOXICITY: Contains no harmful dioxin. Slightly high acute mammalian toxicity; oral LD<sub>50</sub> mice (mg/kg) = (400). May be toxic to bees.
15. PRECAUTIONS, FIRST AID: Do not spray on foraging bees. Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - do NOT induce vomiting. Get medical attentions.
16. STORAGE: May be stored at any temperature. Shake well after storing for 1 year or longer.

**FUSILADE (fluazifop-butyl) \***  
Chipman



CAUTION POISON

1. FORMULATIONS: Emulsifiable concentrate - 250 g/L, 8 L.

2. REGISTERED MIXES: Fusilade + 2,4-DB; Fusilade + metribuzin (Lexone, Sencor)

3. CROPS:

alfalfa*	clover, red*	potatoes	sunflowers (9.0)
bird's-foot trefoil	flax (8.4)	sugar beets (8.9)	

\* Do not graze or harvest for feed in year of treatment.

4. WEEDS CONTROLLED:

barley (6.2)	foxtail, green (7.0)	Johnson grass	quackgrass (6.4)
barnyard grass (7.5)	foxtail, yellow	millet, wild proso	wheat (9.0)
corn		Persian darnel (6.8)	wild oats (7.5)

5. WEEDS SUPPRESSED: At lower rate, yellow and green foxtail.

6. WHEN USED: When weeds are actively growing; 2-4 leaf stage of green and yellow foxtail; 3-5 leaf stage quackgrass (season-long control); 2-6 leaf stage of other grassy weeds and corn (prior to tillering).

7. HOW TO APPLY:

With: Ground equipment

Rate: **Corn:** 250 mL/ac. **Barnyard grass, Johnson grass, Persian darnel, barley, wheat:** 330 mL/ac **Wild oats, wild proso millet** 400 mL/ac **Green and yellow foxtail suppression:** 400 mL/ac - 570 mL/ac **Quackgrass (tilled land):** 810 mL/ac. **(non-tilled land):** 1.2-1.6 L/ac

Water Volume: 45-120 L/ac

Pressure: 200-300 kPa

8. SPRAYING TIPS:

- Less effective when plants are stressed by lack of moisture, low temperature and/or very low relative humidity.
- Apply 3 days before the use of any broadleaf herbicide.
- Rhizomes of quackgrass should be thoroughly fragmented by tillage prior to application to obtain control at the lower rate.
- Do not cultivate for 5 days after applying.
- Add Agral<sup>R</sup> 90 at the rate of 1 L for every 1,000 L of spray solution (0.1% by volume). Do not add Agral 90 when tank mixed with other herbicides.

9. HOW IT WORKS: Systemic, readily translocated.

10. EXPECTED RESULTS: Weeds will cease growth, but death takes several weeks.

11. EFFECTS OF RAINFALL: No effect 2 hours after application.

12. MOVEMENT IN SOIL: Not applicable.

13. GRAZING AND CROPPING RESTRICTIONS: Do not harvest alfalfa, red clover, and bird's-foot trefoil for feed or graze livestock in the year of treatment.

14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (4,770). May cause skin and eye irritation.

15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) plus goggles. IF IN EYES or ON SKIN - use standard first aid measures (see page 3).

16. STORAGE: Not affected by freezing.

\* Registration for 1986 will be dependent on the results of the review of toxicological studies and exposure studies conducted in Canada during 1985.

**GLEAN (chlorsulfuron)**

Dupont



CAUTION POISON

1. FORMULATIONS: Dry Flowable 75%; 500 g container.
2. REGISTERED MIXES: Glean with Avenge 200C (wheat, barley), Surfactant, Roundup, Hoe-Grass, Stampede 360, and Mataven.
3. CROPS: Wheat (spring, durum, winter) (9.0), barley (9.0), oats. Spring application on winter wheat.
4. WEEDS CONTROLLED:
 

buckwheat, wild (7.7)	flixweed	lamb's-quarters	smartweeds, annual (8.3)
cleavers (8.2)	hemp-nettle (8.3)	mustard, wild (8.0)	stinkweed (8.2)
chickweed, common (8.6)	kochia	pigweed, redroot (8.5)	thistle (Canada (6.6), Russian
cow cockle (9.0)		rapeseed, volunteer (8.1)	(6.2))
5. WEEDS SUPPRESSED: Canada thistle (6.6), green foxtail.
6. WHEN USED: Wheat (spring, durum), winter wheat (spring application), barley, oats - 2 leaf to flag leaf (shot blade) stage. **Brown and Dark Brown Soils:** post harvest prior to planting spring wheat (except durum). Chemical Fallow (preceding wheat): post harvest prior to fallow or in spring during fallow. Glean + Roundup - fallow preceding wheat.
7. HOW TO APPLY:
 

**With:** Ground equipment. Do NOT apply by air.

**Rate:** 6, 9.2 or 12 g/ac. When tank mixed with wild oat herbicides, follow directions on specific labels. Fall, 8-12 g/ac. Fallow, 12 g/ac. Glean + Roundup, 12 g/ac + 0.3-0.4 L/ac + surfactant.

**Water Volume:** 25 L/ac (minimum)

**Pressure:** 275 kPa

**Nozzles:** Flat fan types. Increased water volumes are required for flood jet or "Raindrop" nozzles.

**Surfactant:** Use 1 L of Agsurf, Agral 90, or Cittowett Plus per 1000 L of spray mixture.
8. SPRAYING TIPS: Use metal or nylon filters only. Filters and screens 50 mesh or larger. Higher spray volumes required for dense crop canopy and/or large weeds. Continuous agitation is required. **Ensure that Glean is completely suspended before adding other herbicides.** Effectiveness may be reduced if spray mixture remains in tank for more than 24 hours. Do not exceed a total of 12 g/ac within a 12 month period.
- To avoid injury to crops susceptible such as canola** thoroughly clean sprayer immediately after spraying as follows:
  1. Drain and flush tank, boom and hoses with clean water for a minimum of 10 minutes.
  2. Fill tank with clean water, add 0.5 L chlorine bleach (containing 5.25-6.0% sodium hypochlorite) per 100 L of water. Flush through boom and hoses, allow to sit for 15 minutes with agitation, drain.
  3. Repeat step 2.
  4. Nozzles and screens should be removed and cleaned separately. To remove traces of chlorine bleach, rinse tank thoroughly with clean water and flush through hoses and boom.

**NOTE:** Do NOT use chlorine bleach with ammonia. All traces of liquid fertilizer containing ammonia or ammonium nitrate or ammonium sulphate must be removed from application equipment before adding chlorine bleach solution. This can be done effectively by rinsing with water, failure to do so will result in a release of a gas with a musty chlorine odor which can cause eye, nose, throat and lung irritation. Do NOT clean equipment in an enclosed area.
9. HOW IT WORKS: Absorbed by foliage and roots. Inhibits cell division.
10. EXPECTED RESULTS: **Weeds:** growth stops almost immediately. After 7-10 days yellowing or purpling will occur followed by complete desiccation. Glean remains active in soil throughout the growing season controlling later germinating weeds. **Poor results may be expected if:** improper mixing, timing, coverage or when weeds are under drought stress.
11. EFFECTS OF RAINFALL: Heavy rainfall immediately after application may cause temporary lightening of crop.
12. MOVEMENT IN SOIL: Movement is restricted by fine textured soils, soil organic matter and neutral to acidic conditions.
13. GRAZING AND CROPPING RESTRICTIONS: **Grazing restrictions:** None. **Drift:** Use extreme care to prevent drift onto desirable plants or non-target agricultural land. **Succeeding Crops:** Glean may only be used on land with pH 7.5 or less and used exclusively for production of wheat, barley or oats for at least the next 2 years. **Recropping:** Soils with pH 7.0 or less, wheat or barley may be seeded the following season (10 months). Soils with pH 7.1-7.5 only wheat may be seeded the following season. On soils with pH 7.1-7.5 barley may be seeded the second season (22 months). Recropping to peas or canola in Black Soil Zones, where pH is less than 7.0 and organic matter content is greater than 5% is possible after 3 seasons (34 months). If rainfall in any 1 season is less than 250 mm, extend this interval by 1 year.
- NOTE:**
  - (a) A field bioassay is required 1 year before sowing any other crop.
  - (b) All cropping restrictions which apply to Glean alone will apply to wild oat herbicides + Glean tank mix.
14. TOXICITY: Low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (5,919).
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN - use standard first aid measures (see page 3).
16. STORAGE: Store in a cool, dry place.

**GRAMOXONE (paraquat)**

Chipman



DANGER POISON

1. FORMULATIONS: Solution 200 g/L - 1 and 5 L containers.
2. REGISTERED MIXES: None Mix restrictions: Not applicable
3. CROPS: Shelterbelts, stale seedbed for vegetables and field crops, potatoes, sugar beets, non-crop land, and chemical mowing.
4. WEEDS CONTROLLED: All top growth, repeat applications may be necessary on perennial weeds. Annual weeds generally killed with 1 application.
5. WEEDS SUPPRESSED: Most perennial weeds.
6. WHEN USED: Prior to crop emergence, but soon after weeds emerge.
7. HOW TO APPLY:  
**With:** Ground equipment only.  
**Rate:** *Shelterbelts:* Apply 2.2 L Gramoxone in 440 L of water/ac or 75 mL in 10 L of water/100 m<sup>2</sup>. 550 mL of this mixture will treat an area 1.75 m in diameter around a tree. *Stale Bed Technique for Vegetable and Field Crops:* Pre-emergent to crop, post-emergent to weeds: In beans (all types), beets, carrots, cole crops, corn, cucumbers, onions, peas, potatoes, soybeans, and turnips, prepare a seedbed at least 2-4 weeks before seeding to stimulate weed growth. Seed with minimum soil disturbance. To burn off emerged weeds apply 1-2 L Gramoxone in 120-440 L of water/ac prior to or after seeding. Do not apply later than 3 days before crop emergence. Use 2.0 L/ac when weeds are above 5 cm tall, and greater volumes of water on dense weed growth. *Potatoes:* Apply up to ground crack only for Netted Gem and Cherokee. For other varieties apply up until the first potato tops are 5-8 cm. To control quackgrass, annual grasses and broad-leaf weeds apply 1-1.75 L in 120-200 L of water/ac; for emerged seedlings thereof use only 610 mL of Gramoxone in 120-220 L of clean water/ac. **NOTE:** Application to exposed or emerged potato foliage will cause temporary injury and chlorosis. Do not apply to emerged potato foliage in evening, or when potatoes are under moisture stress due to extremely dry soil conditions, or to early potatoes. Use of poor or diseased seed and cut seed with 1 eye will make potatoes more susceptible to injury by post-emergence Gramoxone sprays. This will eliminate several cultivations, but will not control weeds that germinate after treatment. *Non-Crop Land:* Rapid top kill of weeds and grasses as a foliar spray. Apply 2.2-4.5 L of Gramoxone in 220-440 L/ac thoroughly wetting all foliage. *Chemical Mowing:* For rapid scorch of weeds and grasses, apply 1.0 L in 220-440 L of water/ac, thoroughly wetting all foliage. *Weed Control in Non-Crop Land and Chemical Mowing:* Gramoxone may be tank mixed with certain soil sterilants where immediate top kill and long-term sterilization are required. **Water Volume:** Thoroughly wet all foliage. For dense weed growth use the greater volume of water.  
**Incorporation:** Not applicable  
**Pressure:** 300 kPa
8. SPRAYING TIPS: Use high volume, low pressure type spraying equipment to thoroughly cover foliage. Special equipment is necessary to shield some row crops from spray. Applications on cloudy days, or just prior to or during periods of darkness will generally increase effectiveness of the treatment. Do not apply with mist blowers. It is important to thoroughly wash equipment after spraying - use a wetting agent (Agral 90 at 60 mL/100 L of water), flush and spray out, then thoroughly rinse with clean water. If possible, equipment should be filled with clean water and left overnight. Spray out before storing equipment or using other materials. Use only clean water to avoid reduction in effectiveness.
9. HOW IT WORKS: Gramoxone is absorbed by leaves and stems, but does not translocate.
10. EXPECTED RESULTS: Gramoxone provides immediate, fast and virtually complete annual weed kill from 1 application. Repeat applications may be necessary for perennial weeds. Yellowing occurs within a few hours and desiccation of the plant continues rapidly until death. Gramoxone is inactivated on contact with soil, it has no residual effect. Rain prior to spray solution drying on plant or muddy water will reduce effectiveness of the chemical.
11. EFFECTS OF RAINFALL: Once spray solution has dried on plant tissue, rain will not reduce effectiveness of Gramoxone.
12. MOVEMENT IN SOIL: Gramoxone binds to the soil and becomes biologically unavailable.
13. GRAZING AND CROPPING RESTRICTIONS: *Drift:* Prevent drift onto crops, ornamentals lawns, grazing areas or other desirable areas. *Grazing Restrictions:* Not applicable *Crop Use After Hail:* and *Succeeding Crops:* No restriction.
14. TOXICITY: Very high acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (120). Symptoms of acute poisoning may occur. May be fatal if swallowed.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2), goggles and respirator. KEEP OUT OF REACH OF CHILDREN AND ANIMALS. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). See a doctor immediately.
16. STORAGE: NEVER transfer to other containers. Heated storage preferred. Will crystallize if frozen.

**HERBEC 20P (tebuthiuron)**

Elanco



Available only to approved personnel

WARNING POISON

1. FORMULATIONS: 20% Pellets - 20 kg bag
2. REGISTERED MIXES: None registered. Mix restrictions: Not applicable. Mixing with other pesticides: Not recommended.
3. CROPS: Industrial brush control.
4. WEEDS CONTROLLED: Alder, balsam fir, birch, pine, poplar, spruce (black, white), tamarack, willows.
5. WEEDS SUPPRESSED: Not applicable.
6. WHEN USED: Herbec 20P may be applied any time the ground is not frozen or snow-covered. Summer and fall applications will control brush the following year.
7. HOW TO APPLY:  
With: Air or ground granular applicator  
Rate: 6.9-8.9 kg/ac
8. SPRAYING TIPS:
  - (a) Do not use on or near field crops, desirable trees or shrubs, or areas into which their roots may extend or in locations where the chemical may be washed into contact with their roots, as injury or death may occur.
  - (b) The granular applicator must be properly calibrated to ensure uniform distribution.
9. HOW IT WORKS: Absorbed by roots. Applied to the soil surface it is moved slowly into the soil by rainfall. The rate of movement depends upon soil-type, amount of rainfall. Shallow-rooted species will be killed more quickly than deep-rooted species.
10. EXPECTED RESULTS: Product applied in the summer and fall of 1 year will start to control brush later in the following year. Some species may undergo repeated defoliation and complete kill may come as late as 24-36 months after application. Since the number of pellets/ac is very low, the effect on ground cover is minimal. Application onto frozen ground may give poor results.
11. EFFECTS OF RAINFALL: Increased rainfall will increase the speed at which this product kills brush.
12. MOVEMENT IN THE SOIL: To be effective Herbec 20P must be leached into the root zone of the brush. Movement in the soil is vertical and not lateral. Depth of leaching rarely goes beyond 18 inches (45 cm).
13. GRAZING AND CROPPING RESTRICTIONS: **Grazing Restrictions:** Do not graze treated area. **Succeeding Crops:** An industrial brush control for use on non-crop land.
14. TOXICITY: Slightly high mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (644). Not toxic to cattle. Slightly toxic to birds and fish.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN - use standard first aid measures (see page 3).
16. STORAGE: Store in a dry area.

# HERITAGE (trifluralin)

Elanco

## Wheat - Brown Soil Zones Only

1. FORMULATIONS: Granular 5%; 25 kg bag.
2. REGISTERED MIXES: None
3. CROPS: Wheat (spring, durum) (8.6). Underseeding: Not recommended.
4. WEEDS CONTROLLED: **Fallow Year:**

buckwheat, wild (8.3)	foxtail, green (8.1)	lamb's-quarters (8.0)	pigweed, redroot (8.2)
cow cockle (9.0)	grass, barnyard (8.3)	oats, wild (7.5)	thistle, Russian
darnel, Persian			

**Crop Year:** Green foxtail and lamb's-quarters.
5. WEEDS SUPPRESSED: Crop Year: Wild buckwheat, wild oats.
6. WHEN USED: Apply to summerfallow in May, June and July for weed control during both years of a summerfallow-wheat rotation. Maximum benefit comes when applied as early as possible in the fallow year.
7. HOW TO APPLY:

**With:** Ground equipment with granular applicator.  
**Rate:** May 8.9 kg/ac, June 7.7 kg/ac, July 6.5 kg/ac. Brown Soil Zones Only.  
**Incorporation:** If green growth prevents proper mixing, it must be destroyed before application. Apply over standing or pre-worked stubble, provided straw is chopped and evenly distributed. Incorporate within 24 hours of application to 5-8 cm with cultivator (field or deep tillage) at 10-13 km/h or disc at 7-10 km/h. Do second incorporation at the same depth and right angles to the first whenever necessary to control resistant weeds in fallow year. Cultivation with a rodweeder or shallow tillage cultivator may be required. Do not cultivate when soil is crusted, lumpy or too wet for good mixing action or in soils with more than 8% organic matter. Working deeper than 8 cm can result in erratic weed control and crop injury.
8. SPRAYING TIPS: Do not apply on soils subject to prolonged flooding, sandy soils with less than 1% organic matter, or soils in poor working condition. Application to severely eroded knolls may result in reduced crop stands. In the fall, prior to application, spread straw evenly over field and leave stubble standing to trap snow. For maximum effectiveness apply in May. In crop year, after application and when soil is warm enough for good germination, prepare seedbed with field cultivator set at 5 cm deep. Seed into a weed-free seedbed, 3-6 cm deep, using double disc or hoe drill. Separate spring tillage may not be necessary with a discer or airseeder. Pack or harrow after seeding. Drought conditions in fallow year, prior to seeding, may result in higher carryover of Heritage at seeding time. To reduce possible injury by carryover, seeding to the correct depth (3-6 cm) is critical. After filling granular applicator, close lid quickly to avoid exposure to direct sunlight.
9. HOW IT WORKS: Seedlings are killed during germination by inhibited cell division at active growing points. This results in puffy, brittle, slow growing shoots and swollen brittle root tips. Established weeds are not controlled.
10. EXPECTED RESULTS: **Weeds:** After first incorporation, susceptible weeds are partially controlled. After second operation, susceptible weeds are controlled before emergence. **Crop:** No injury to wheat, after summerfallow. Over-application may reduce crop stand, delay development or reduce yields.
11. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (10,000). Non-toxic to bees; very toxic to fish. Large amounts of Heritage can be tolerated by fish in runoff or muddy water because it binds to suspended soil.
12. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) to reduce exposure. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical attention.
13. STORAGE: Store in areas not exposed to high temperatures, prolonged direct sunlight or moisture.

**SPECIAL USE:** Fall application only - Wheat (spring, durum).

**Weeds Controlled:** Green Foxtail.

**When Used:** Fall application only - Sept. 1 to freeze up.

**Rate:** 4.5 kg/ac.

**Incorporation:** (as above) First incorporation within 24 hours of application, 5-8 cm deep. Second incorporation at same depth and right angles to first, in the fall at least 3 days later or in the spring during seedbed preparation.

## HOE-GRASS II (diclofop-methyl/bromoxynil)

Hoechst

1. FORMULATIONS: Emulsifiable concentrate 230 g/L diclofop-methyl + 80 g/L bromoxynil - 20 L.
2. REGISTERED MIXES: Hoe-Grass II + MCPA (amine or Ester), Decis.
3. CROPS: Wheat (spring (8.7), durum), barley (8.4) (do not apply to 2-row varieties), flax (7.6), triticale, spring rye. Do not treat crops underseeded to legumes.
4. WEEDS CONTROLLED:

buckwheat, Tartary (7.2)	corn, volunteer (8.4)	knawel	oats, wild (7.4)
buckwheat, wild (8.0)	darnel, Persian (2.0)	kochia (8.2)	pigweed, redroot (8.8)
catchfly, night-flowering (8.8)	foxtail (green, yellow (7.4))	lamb's-quarters (8.6)	smartweed, green (8.8)
chamomile, scentless (8.7)	grass, barnyard (9.0)	mustard, wild (8.3)	stinkweed (8.2)
cow cockle (7.9)	groundsel, common (9.0)		thistle, Russian (8.9)
5. WEEDS SUPPRESSED: None
6. WHEN USED: 1-4 leaf stage of wild oats, green and yellow foxtail, and barnyard grass. 1-3 leaf stage of persian darnel and a height of 15-25 cm for volunteer corn. Broadleaved weeds are controlled from seedling to early 4 leaf stage (except for Russian thistle where the stage is seedling to 5 cm in height). Flax 5-10 cm in height.
7. HOW TO APPLY:

With: Ground equipment only. Do not apply by air.  
Rate: 1.4 L/ac  
Water Volume: 45 L/ac  
Pressure: 275 kPa.  
Nozzles: Do not use flood jet type nozzles or controlled droplet application equipment.
8. SPRAYING TIPS:

(a) Nozzles should be tilted 45° forward to ensure better coverage.  
(b) For best results and maximum yield enhancement, apply when majority of weeds are in the 2-3 leaf stage.  
(c) During periods of stress (heat, drought or low humidity) reduced weed control may result.  
(d) Hoe-Grass II must be applied at least 4 days before the use of any other herbicide to eliminate a reduction of control.
9. HOW IT WORKS: Diclofop-methyl possesses contact as well as systemic action. Uptake is primarily through the leaves. The site of action is the growing point. Bromoxynil is primarily a contact herbicide with limited translocation in susceptible annual broadleaved weeds.
10. EXPECTED RESULTS: Yellowing of susceptible plants are visible within 2-4 days. New leaf growth exhibits light chlorosis which deepens and browning develops within 10-14 days of application. Photosynthesis and growth are inhibited and uptake of water and nutrients ceases. Lack of adequate crown root development is 1 of the most distinguishable features of diclofop-methyl activity. Bromoxynil activity is evident within 24 hours as necrotic spots appear on the leaves of susceptible broadleaved weeds. This damage spreads rapidly until the plants ultimately die. Chlorosis may develop in the untreated leaves of these susceptible weeds even though very little movement of the bromoxynil occurs. **Precautions:** *Barley* - Hoe-Grass II must be applied in the 1-4 leaf stage of the barley and prior to tillering. Application beyond the 4 leaf stage or after tillering will result in crop damage. Under certain environmental conditions, yellow blotches may appear on the barley leaves. These blotches will be rapidly outgrown and will not affect maturity or yield. DO NOT APPLY TO TWO-ROW BARLEY VARIETIES IN ALBERTA. *Flax* - Hoe-Grass II must be applied when the flax is 5-10 cm in height. Do not spray flax during periods of heat or humidity stress as it may cause leaf burn, retarded growth and a slight maturity delay.
11. EFFECTS OF RAINFALL: Rainfall within 1 hour will decrease activity.
12. MOVEMENT IN SOIL: Some movement may occur if sufficient moisture is present.
13. GRAZING AND CROPPING RESTRICTIONS: **Drift:** Avoid treatment near susceptible crops. **Grazing Restrictions:** Do not graze treated field prior to harvest. Do not use treated field for green forage. Do not apply Hoe-Grass II within 60 days of harvest. **Succeeding Crops:** No restriction.
14. TOXICITY: Very low toxicity; acute oral LD<sub>50</sub> rats (mg/kg) = (2,350). Eye irritant. Toxic to fish.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) plus goggles to reduce eye exposure. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - do NOT induce vomiting but rush person to nearest hospital.
16. STORAGE: Do not store below freezing. If stored for 1 year or longer, shake well before using.

# HOE-GRASS 284 (diclofop-methyl)

Hoechst



WARNING POISON

1. FORMULATIONS: Emulsifiable concentrate - 284 g/L - 20 L pack.

2. REGISTERED MIXES: Hoe-Grass 284 + Torch, Torch DS, Pardner, Lontrel, Glean, Decis.

3. CROPS:

barley (except Klages, Betzes) (8.2)  
beans, dry common (8.8) (black, white + pinto only)  
buckwheat, tame (8.1)  
carrots  
fababeans (9.0)  
flax (8.9)  
lentils (8.4)

mustard, tame (8.9)  
onion, dry bulb (8.6)  
peas (field, canning) (9.0)  
potatoes (8.7)  
rapeseed (8.9)  
rye, fall (9.0)  
rye, spring (8.7)

soybeans (8.8)  
sunflowers (8.4) (except Corona variety)  
triticale (8.8)  
wheat, spring (8.5)  
wheat (winter, durum) (9.0)

**Following Perennials:**  
grasses, legumes for seed, in year of establishment:  
aflalfa (9.0)  
bromegrass  
clover (red, sweet)  
fescue, creeping red (8.8)  
ryegrass, Russian wild (7.6)  
wheatgrass, crested (8.2)  
wheatgrass, intermediate

4. WEEDS CONTROLLED: Wild oats (7.7), foxtail (green, yellow) (7.6), barnyard grass (8.0), Persian darnel (7.0), volunteer corn.

5. WEEDS SUPPRESSED: None

6. WHEN USED: 1-5 leaf stage of wild oats, 1-4 leaf stage of green and yellow foxtail, and barnyard grass. 1-3 leaf stage of persian darnel and a height of 15-25 cm for volunteer corn. Apply to barley in the 1-4 leaf stage and prior to tillering.

7. HOW TO APPLY:

With: Ground or aircraft.

Rate: 1.0 L/ac. **Special Crops:** 1.4 L/ac. **Wild oats:** in the 4-5 leaf stage, apply at 1.1 L/ac. **When tank mixing with bromoxynil:** use 1.1 L/ac.

**Water Volume:** Aircraft - minimum of 15 L/ac, Ground - 44 L/ac

**Pressure:** Aircraft - 300 kPa, ground - 275 kPa

**Nozzles:** Do not use flood jet nozzles.

8. SPRAYING TIPS: Nozzles should be tilted 45° forward to ensure better coverage. When tank mixing with bromoxynil do not delay Hoe-Grass 284 application if grassy weed is in correct stage. Reduced control can be expected if Hoe-Grass 284 is applied to weeds growing under stress. Control may be further reduced if tank mixed. Apply at least 4 days before any broadleaf herbicide, except bromoxynil products, to eliminate a reduced grass kill from Hoe-Grass 284. Do not use Controlled Droplet Application equipment.

9. HOW IT WORKS: Contact as well as systemic action. Uptake primarily through leaves and translocated to growing point. Penetration and uptake via roots may occur if soil is sufficiently moist and the rate of application is relatively high.

10. EXPECTED RESULTS: Yellowing of susceptible plants is noticeable within 2-4 days of application. New leaf growth exhibits light chlorosis which deepens and browning develops 10-14 days after application. Photosynthesis and growth are inhibited and uptake of water and nutrients ceases. Lack of adequate crown root development is evident on wild oats as well as in some sensitive barley varieties.

11. EFFECTS OF RAINFALL: Rainfall within 1 hour will decrease activity.

12. MOVEMENT IN SOIL: Some movement in soil if sufficient moisture is present.

13. GRAZING AND CROPPING RESTRICTIONS: **Drift:** Danger from drift is low. **Grazing Restrictions:** Do not graze treated green crop. Do not apply within 60 days of harvest. **Succeeding Crops:** No restriction.

14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (2,235). Toxic to fish; non-toxic to birds.

15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - do NOT induce vomiting. Get medical attention immediately.

16. STORAGE: Do not store below freezing. If stored 1 year or longer, shake well before using.

## HYVAR X (bromacil)

DuPont

1. FORMULATIONS: 80% wettable powder - 25 kg, 2 kg packs. Water soluble liquid: 240 g/L (Hyvar X L) - 4 L, 10 L packs.
2. REGISTERED MIXES: None
3. CROPS: Non-crop land only. Total vegetation control.
4. WEEDS CONTROLLED: Hyvar X is a non-selective, total vegetation control chemical for weeds, grasses and some brush as: alder, aspen and balsam poplar, ash.
5. WEEDS SUPPRESSED: Not applicable
6. WHEN USED: See "Soil Sterilants" page 4.
7. HOW TO APPLY:
  - a) **Hyvar X Liquid**

**With:** Power sprayer. Handguns, backpack sprayers or a watering can may be used to treat small areas.

**Rate:** *Initial treatment:* Apply 12-18 L/ac. Higher dosage on soils containing 5% or more organic matter, or soils high in clay content. *Retreatment to control regrowth as alfalfa:* 7-9 L/ac. **For small areas:** apply 450 mL on 100 m<sup>2</sup>. **Brush Control:** Spot Treatment - apply undiluted at 8 mL/m of tree height up to 3 m. Four or five 8 mL deposits around the root collar for brush taller than 3 m.
  - b) **Hyvar X**

Same as Hyvar X L, except more efficient agitation of the spray solution is required.

**Rate:** *Initial treatment:* 3-5 kg/ac. Use the higher dosage on soils containing 5% or more organic matter, or soils high in clay content. **When weeds and grasses reappear:** apply 1.5-2.7 kg/ac **Brush Control** Mix 870 g Hyvar X in 10 L of water and apply 30-60 mL/stem 5-10 cm in basal diameter. Wet base of stem to point of runoff.

**Water Volume:** For application of Hyvar X L with a handgun apply 650 L of spray solution/ac. For mixing of Hyvar X use a minimum of 20 L of water/kg of Hyvar X. See "Soil Sterilants" page 4.
8. SPRAYING TIPS: See "Soil Sterilants" page 4.
9. HOW IT WORKS: Hyvar X is readily absorbed through the roots but much less readily through the leaves. Once in the plant it inhibits photosynthesis. **Caution:** Do not apply closer than 1.5 times the height of desirable vegetation.
10. EXPECTED RESULTS: Susceptible plants become chlorotic and then die. Vegetation kill is faster with higher rainfall. **Poor results may be expected if:** weed growth too mature or if there is insufficient rainfall.
11. EFFECTS OF RAINFALL: Rainfall will carry the chemical into the root zone where it is absorbed.
12. MOVEMENT IN SOIL: Movement in soil is dependent upon soil type and soil moisture. Bromacil will move faster in a vertical direction in sandy soils than in soils high in organic matter or clay content. Movement can be severe on slopes.
13. GRAZING AND CROPPING RESTRICTIONS: **Drift:** All crops and ornamentals may be injured by chemical drift. Do not apply in areas subject to severe soil erosion.
14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (5,200). Toxic to fish.
15. PRECAUTIONS AND FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical attention.
16. STORAGE: Hyvar X - Store in a cool dry place. Hyvar X L - Combustible, keep away from heat or open flame. Do not allow to freeze.

**KARMEX (diuron)**

DuPont

1. FORMULATIONS: 80% wettable powder - 2 kg, 25 kg packs.
2. REGISTERED MIXES: None
3. CROPS: Asparagus; irrigation and drainage ditches, ponds, dug-outs and spot treatment for general weed control. Non-crop areas.
4. WEEDS CONTROLLED: Broad leaved and grassy weed seedlings.
5. WEEDS SUPPRESSED: Not applicable
6. WHEN USED: Karmex may be used at any time, except when the ground is frozen. Sufficient rainfall or irrigation is necessary following treatment to carry the chemical to the root zone.
7. HOW TO APPLY:  
**With:** Field sprayer, hand sprayer, back-pack or sprinkling can.  
**Rate:** *General Weed Control:* Apply 5.8-11 kg/ac on sand or sandy soils. Apply 16-22 kg/ac on clay or high organic soils. Use the lower rate when annual weed growth predominates and where only one season's control is desired. *Retreatment:* When regrowth begins apply 500 g/ac to control annuals and seedlings. *Irrigation and Drainage Ditches:* Apply 250-750 g/100 m<sup>2</sup> or 9.3-27 kg/ac. Apply during the non-crop season when the ditch is not in use. Flush once before using for irrigation purposes. Karmex must be fixed in the soil by moisture to minimize movement in irrigation water. *Spot Treatment:* Spot treat at 0.75-1.0 kg/100 m<sup>2</sup> to control couch grass and toadflax. A rate of 50 g of Karmex applied on 10 m<sup>2</sup> is equal to 20.2 kg/ac.  
**Water Volume:** Use 100-160 L of water/acre to provide thorough, uniform coverage.
8. SPRAYING TIPS: See "Soil Sterilants" page 4.
9. HOW IT WORKS: Diuron is readily absorbed through the root system and less readily absorbed through stem and foliage.
10. EXPECTED RESULTS: Susceptible plants become chlorotic soon after treatment and then die. Poor control may be expected from inadequate rate or weeds too old or insufficient rainfall. Application on slopes may cause erosion. Application too near feeding roots of susceptible vegetation may cause injury.
11. EFFECTS OF RAINFALL: Rainfall will activate the chemical, carrying it into the root zone.
12. MOVEMENT IN THE SOIL: Diuron absorbs readily to the soil and there is little movement by leaching.
13. GRAZING AND CROPPING RESTRICTIONS: *Drift:* All crops and ornamentals may be injured by chemical drift. *Succeeding Crops:* Only on non-crop land.
14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (3,400). Non-toxic to birds and fish.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN - use standard first aid measures (see page 3).
16. STORAGE: Store in a cool dry place.

**KERB 50W (propyzamide)**  
Rohm and Haas

1. FORMULATIONS: 50% Wettable Powder - 2.0 kg bags
2. REGISTERED MIXES: None specified.
3. CROPS: Alfalfa (first year and established) (8.7), grass (established), pastures - grass/legume bird's-foot trefoil.
4. WEEDS CONTROLLED:

barley, foxtail (7.5)	grain, volunteer	oats, wild (5.9)	timothy
chickweed (8.2)	grass, orchard (8.3)	quackgrass, seedling (7.4)	
5. WEEDS SUPPRESSED: None.
6. WHEN USED: Fall - alfalfa, bird's foot trefoil. Spring - alfalfa seed crops.
7. HOW TO APPLY:

With: Ground equipment only.

Rate: **Pastures:** 360 g/ac on brown, dark brown, gray wooded soils. 450 g/ac on thin black and black soils. **First year and established legumes:** 710 g/ac. Fall or spring - controls annual grasses as volunteer cereals or wild oats 910 g - 1.3 kg/ac. Fall only - controls quackgrass, orchard grass, timothy, chickweed. **Water volume:** 40-200 L/ac

Incorporation: None. Spring application on alfalfa seed crops - if soil temperature is high and moisture low - a light incorporation is suggested.

Pressure: 275 kPa.

Nozzles: Flat fan.
8. SPRAYING TIPS: **Fall Application:** when soil temperature is low but above freezing and soil moisture high. Rain in a day or 2 or light overhead irrigation improves results. **Spring Application:** Best when soil temperature is cool. Do not use on high organic matter, peat or muck soils. Spray overlaps may seriously injure desirable grass. Apply between October 1 and freeze up. Do NOT use on timothy, fescue or perennial blue grass. Do NOT use in seed grass stands. Use 50 mesh or larger metal filters and nozzle screens. Best results when soil temperature is low but above freezing and soil moisture high.
9. HOW IT WORKS: Root absorption. Inhibits cell division.
10. EXPECTED RESULTS: Plant growth stops, turns brown and dies.
11. EFFECT OF RAINFALL: Improves efficacy.
12. MOVEMENT IN SOIL: Very little leaching. Readily absorbed on organic matter.
13. GRAZING AND CROPPING RESTRICTIONS: Do not harvest or graze within 90 days of applying 1.3 kg/ac or 60 days after lower rates. Wait 9 months before planting other crops.
14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) rats = (8,350).
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) to avoid exposure. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical attention.
16. STORAGE: Store in cool dry place.

**KIL-MOR (2,4-D + mecoprop + dicamba)**  
Ciba-Geigy



**CAUTION POISON**

1. **FORMULATIONS:** Water soluble solution containing 295 g/L 2,4-D + 80 g/L mecoprop + 110 g/L dicamba; 10 L containers.
2. **REGISTERED MIXES:** Kil-Mor 345-445 mL/ac + Aatrex Liquid 2.25 L/ha or Aatrex Nine-O 1.25 kg/ha.
3. **CROPS:** Spring (including durum) and winter wheat (7.9), flax, oats (8.6), barley (8.5), sweet (7.3) and field corn (7.3). **Underseeding:** Not recommended
4. **WEEDS CONTROLLED:**

<i>In crops</i>	<i>Along roadsides</i>		
artichoke, Jerusalem (in corn)	flixweed (7.8)	ragweed, common	alders
bindweed, hedge	knotweed	shepherd's-purse (8.6)	chicory
buckwheat, Tartery (7.9)	lady's-thumb	smartweeds, annual (7.7)	cockle, white
buckwheat, wild (7.9)	lamb's-quarters (8.5)	sow-thistle, annual	goat's-beard
cocklebur	mustards (8.6)	spurry, corn (7.3)	poison ivy
cow cockle (7.6)	peppergrass	stinkweed (8.8)	ragwort
flax	pigweed (prostrate, redroot) (7.9)	thistle, Russian (7.3)	sheep-laurel
			thistle, bull
5. **WEEDS SUPPRESSED:** Field bindweed, Canada thistle, cleavers, round-leaved mallow.
6. **WHEN USED:** **Spring wheat:** 3-5 leaf stage. **Winter wheat:** in spring before crop is 30 cm high **Oats:** 3-4 leaf stage **Barley:** 2-3 leaf stage **Corn:** Overall spray prior to 15 cm height of corn, use drop nozzles after 15 cm height **Roadsides:** Spring when weeds are in 2-5 leaf stage and growing actively. **Flax:** 10 cm high (no later).
7. **HOW TO APPLY:**

**With:** Ground equipment

**Rate:** Spring wheat, winter wheat, oats, sweet corn - 340-450 mL/ac. Roadsides - 1.3 L/ac.

Summerfallow - 450-710 mL/ac

**Water Volume:** 40 L/ac for cereals and flax, 80-140 L/ac for corn.

**Pressure:** 275 kPa
8. **SPRAYING TIPS:** Barley is the most sensitive crop to Kil-Mor. Ensure that proper rate, water volume and timing is used, otherwise, crop injury may occur. Risk of crop injury increases as water volume drops below 36 L/ac.
9. **HOW IT WORKS:** Kil-Mor accumulates in the growing points resulting in abnormal growth which disrupts the transport system in plants.
10. **EXPECTED RESULTS:** **Weeds:** Visible effects occur 7-14 days after spraying. Leaves curl, leaf petioles twist, leaf edges turn brown, whole plant ceases growth and eventually turns brown and dies. **Crop:** Improper applications can result in abnormal bending at the internodes of grain stalks, difficulty in head emergence from sheath, curled awns, malformed kernels and sterile florets. **Poor results may be expected if:** Inadequate coverage. Rainfall less than 4 hours after application. Weeds overmature.
11. **EFFECTS OF RAINFALL:** Do not spray if rain is expected within 4 hours.
12. **MOVEMENT IN SOIL:** Not applicable
13. **GRAZING AND CROPPING RESTRICTIONS:** **Drift:** Tomatoes, sugar beets, sunflowers, beans, turnips, cauliflower, cabbage, ornamentals and fruit crops are very sensitive to drift. **Grazing Restrictions:** None. **Crop Use After Hail:** No restrictions. **Succeeding Crops:** No restrictions.
14. **TOXICITY:** Low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (1,028). **Mecoprop has potential to produce enlarged kidneys after long-term continuous exposure.** 2,4-D in formulation contains no dioxin. Non-toxic to fish; toxic to bees.
15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page 2) to reduce exposure. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical attention.
16. **STORAGE:** Heated storage only.

**KRENITE (fosamine)**

DuPont

1. FORMULATIONS: Solution - 480 g ammonium salt - 10 L pack.
2. REGISTERED MIXES: Krenite + a non-ionic surfactant.
3. CROPS: Brush control on non-crop land only.
4. WEEDS CONTROLLED: Alder, ash, aspen (trembling), birch, elm, pine and white spruce.
5. WEEDS SUPPRESSED: Not applicable
6. WHEN USED: From mid-June to end of July.
7. HOW TO APPLY:  
**With:** High volume. Ground equipment.  
**Rate:** Use 10.0-15.0 L/1,000 L of water and add 1-2 L of surfactant to the mixture. Use higher rate for white spruce.  
**Water Volume:** Apply 200-1,200 L of spray solution/ac to point of run-off.
8. SPRAYING TIPS: Do not apply to food crops. A non-ionic surfactant is required to control most conifers and to control the root suckering of deciduous brush.
9. HOW IT WORKS: Absorbed by leaves, stems and buds. Restricts bud development the following spring.
10. EXPECTED RESULTS: Injury may not be observed until the following spring, particularly if minimum rates are used or if cool temperatures prevail when spraying was done. Plants will fail to develop leaves and subsequently die.
11. EFFECTS OF RAINFALL: Rainfall within 24 hours of application may reduce effectiveness.
12. MOVEMENT IN SOIL: Little downward movement as Krenite readily adsorbs to soil colloids.
13. GRAZING AND CROPPING RESTRICTIONS: Do not graze on land treated with Krenite.
14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (20,000). Non-toxic to birds and fish.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical attention.
16. STORAGE: Store in a cool dry place.

## KROVAR I (bromacil + diuron)

DuPont

1. FORMULATIONS: 40% diuron + 40% bromacil, 2 and 25 kg.
2. REGISTERED MIXES: None
3. CROPS: Non-crop land only. Total vegetation control.
4. WEEDS CONTROLLED: Most annual and perennial weeds and grasses.
5. WEEDS SUPPRESSED: Not applicable
6. WHEN USED: Apply Krovar I before weeds emerge or when actively growing. Sufficient moisture is required to carry the chemical to the root zone of the weeds.
7. HOW TO APPLY:  
**With:** Boom sprayer, hand gun, back pack, or sprinkling can.  
**Rate:** *General Weed Control:* Apply 5.3-7.3 kg/ac to control annual and perennial grasses and most broad-leaved weeds. Use higher rates on soils containing 5% or more organic matter or soils high in clay content. Use the 5.5 kg/ac rate on sandy or sandy loam soils only. *Retreatment:* Apply 2.75-3.6 kg/ac when annual weeds reappear on previously treated sites. **Small Areas:** 180 g Krovar I on 100 m<sup>2</sup>.  
**Water Volume:** Use a minimum of 20 L of water/kg of Krovar I.
8. SPRAYING TIPS: See "Soil Sterilants" page 4.
9. HOW IT WORKS: Readily absorbed through the roots, leaves and stems.
10. EXPECTED RESULTS: Plants become chlorotic and then die. **Poor results occur if:** weeds are too mature or insufficient rainfall.
11. EFFECTS OF RAINFALL: Rainfall will leach the chemical into the root zone.
12. MOVEMENT IN SOIL: Soil movement is faster with heavier rainfall. Do not use in areas subject to soil erosion.
13. GRAZING AND CROPPING RESTRICTIONS: **Drift:** All crops and ornamentals may be injured by chemical drift. **Succeeding Crops:** Krovar I is a non-selective residual herbicide. It should only be used on non-crop land where bare ground is desired.
14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = bromacil (5,200), diuron (3,400). Non-toxic to birds; toxic to fish.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN - use standard first aid measures (see page 3).
16. STORAGE: Store in a cool, dry place.

LADDOK (bentazon + atrazine)

BASF



1. FORMULATION: Flowable - bentazon - 200 g/L + atrazine 200 g/L - 10 L pack.

2. REGISTERED MIXES: None

3. CROPS: Corn (field, silage, sweet)

4. WEEDS CONTROLLED:

chickweed, common	lamb's-quarters	pigweed, redroot	smartweed
cocklebur	mustard, wild	purslane	spurry, corn
groundsel, common	nightshade, black	ragweed, common	

5. WEEDS SUPPRESSED: None.

6. WHEN USED: Apply 18-28 days after seeding. Corn tolerant at all growth stages.

7. HOW TO APPLY:

**With:** Ground.

**Rate:** 0.8-1.6 L/ac. Assist Oil Concentrate - 10 L/1000 L of spray volume is recommended.

**Water Volume:** 80-160 L/ac

**Pressure:** 275-400 kPa

**Nozzles:** Flat fan or cone type. Do not use flood jet type.

8. SPRAYING TIPS: Best results if weeds are young and actively growing.

9. HOW IT WORKS: Both bentazon and atrazine are contact herbicides interfering with photosynthesis.

10. EXPECTED RESULTS: **Weeds:** turn yellow, then brown, usually within 2 weeks. **Crops:** occasionally show light leaf speckling. **Poor results may occur if:** weeds are too mature, failure to penetrate crop canopy or under conditions of prolonged cool weather or drought.

11. EFFECTS OF RAINFALL: Within 6-8 hours may reduce activity.

12. MOVEMENT IN SOIL: Very little, except in sandy soil and with excessive moisture.

13. GRAZING AND CROPPING RESTRICTIONS: **Grazing Restrictions:** Treated plants can be used for silage. **Succeeding Crops:** On very light soils with low organic matter some atrazine may carry over and injure susceptible crops.

14. TOXICITY: Low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (3,000).

15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN - use standard first aid measures (see page 3).

16. STORAGE: Store in a cool dry place above 0°C.

## LEXONE (metribuzin)

DuPont

1. FORMULATIONS: Lexone DF (75% dry flowable), 2.5 kg container. Lexone L (480 g/L), 10 L container.
2. REGISTERED MIXES: Both formulations can be mixed with Treflan, MCPA amine, Banvel or Eptam.
3. CROPS: Barley (not Klondike) (8.9), fababeans, peas, field, potatoes (8.6) (except red skinned, early Shepody, ND 146-4R, Rideau, Bellisle or Tobique), tomatoes, wheat (8.5).
4. WEEDS CONTROLLED:

chickweed (8.1)	lamb's-quarters (8.4)	pigweed, redroot	smartweeds, annual (8.5)
hemp-nettle (8.4)	mustard (ball, wild)(8.0)	rapeseed, volunteer (8.8)	spurry, corn (7.1)
lady's-thumb		shepherd's-purse	stinkweed (8.2)
5. WEEDS SUPPRESSED: None
6. WHEN USED: **Wheat, barley:** 2-5 leaf stage **Tomatoes:** Tomato transplants grown for processing only. Apply as directed spray before weeds are 4 cm high. **Potatoes:** Do not use on sandy or coarse textured soils containing less than 1% organic matter as crop injury may result. Potato varieties vary in their resistance to Lexone. Use on limited area to determine safety before large scale sprays are adopted. **Irrigated Potatoes (except Belleisle and Tobique):** Pre-emergence, single application after planting (at least 5 cm deep) or hillling before crop emerges. Early post-emergence, apply following 3 or more days of sunny weather. Treat before weeds are 3 cm and potatoes are less than 10 cm. Some leaf burn may occur. Pre-emergence + post-emergence, follow above directions but do not apply more than 0.57 kg/ac per season. **Dryland Potatoes:** Early post-emergence, apply soon after emergence and before weeds are 4 cm high. Preplant incorporated, apply as by Eptam label. Crop injury may occur if used on soil with greater than 7% organic matter or on sandy or coarse textured soils with less than 2% organic matter. **Fababeans:** With Treflan as a preplant incorporated treatment in the fall or spring.
7. HOW TO APPLY:

With: Ground equipment

**Rate:** **Wheat:** Lexone DF - 110 g/ac. Tank mixed with Banvel at 110 mL/ac or MCPA amine-500 at 345-445 mL/ac for broader weed spectrum. **Barley:** Lexone DF - 110-140 g/ac. Can be tank mixed with MCPA amine-500 at 345-445 mL/ac. The low rate can be mixed with Banvel at 110 L/ac. **Irrigated Potatoes:** Pre-emergence, 340-485 g/ac in 60-120 L water/ac. Early post-emergence, 285-390 g/ac. Pre-emergence + post-emergence, apply no more than 565 g/ac. **Dryland Potatoes:** Early post-emergence, 140 g/ac. Preplant incorporated, 140-200 g/ac Lexone DF plus 1.7-1.8 L/ac Eptam in 80-120 L water/ac. **Fababeans:** Spring preplant incorporate, 140-220 g/ac plus 810 mL/ac Treflan. Fall preplant incorporate, 160-220 g/ac plus 810 mL-1.05 L/ac Treflan. **Tomatoes:** 200-710 mL/ac Lexone L, 430-450 g/ac Lexone DF.
8. SPRAYING TIPS: Use 50 mesh line strainer and screens. Shake container well before adding to sprayer tank. Do not spray if rain is expected within 2 hours. Allow 4-5 day interval before or after application of wild oat herbicides. If frost occurs, allow 4-5 day interval for crop to recover before applying Lexone. Crop must be planted at least 5 cm deep. Do not apply to tomatoes within 60 days of harvest.
9. HOW IT WORKS: A systemic herbicide absorbed by foliage and roots. Affected plants become chlorotic and stunted. Death usually occurs 10-14 days after treatment. Because Lexone leaves a residue in the soil, control of shallow germinating weeds (eg. chickweed) occurs throughout the growing season.
10. EXPECTED RESULTS: **Weeds:** Should start to yellow within 7-10 days after treatment. **Crop:** Temporary (7-10 days) lightening in crop color and occasionally a slight reduction in crop height may occur, especially if frost or abnormally high temperatures occur within 1-2 days of application. Injury to barley can occur if there is shading for 12 hours after spraying. Thus avoid late evening or cloudy day applications. **Poor results may be expected if:** it rains immediately after application or weeds are under stress or too mature.
11. EFFECTS OF RAINFALL: Heavy rainfall immediately after application may decrease activity.
12. MOVEMENT IN SOIL: Not applicable
13. GRAZING AND CROPPING RESTRICTIONS: **Grazing Restrictions:** Do not graze or feed to livestock within 30 days of application. **Succeeding Crops:** No restrictions. **NOTE: Potatoes** - do not apply within 60 days of harvest.
14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (1,100). Slightly toxic to fish and birds; non-toxic to bees.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) and goggles. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical attention.
16. STORAGE: Lexone DF - Cool dry place. Lexone L - warm storage preferred. If frozen ensure material has been thoroughly resuspended.

**LONTREL (cropyralid)**

DOW

1. FORMULATIONS: Solution, 200 g/L; 4 L container.

2. REGISTERED MIXES: Hoe-Grass Poast.

3. CROPS: Canola/Rapeseed (8.6). Underseeding not recommended for forage legumes.

## 4. WEEDS CONTROLLED:

buckwheat, wild (6.1)	hawk's-beard, narrow-leaved	sunflower, volunteer	thistle, Canada (8.3)
chamomile, scentless	ragweed, common	sow-thistle, perennial (7.0)	

## 5. WEEDS SUPPRESSED:

buckwheat, Tary	cocklebur	mallow, round-leaved	smartweed, annual
cleavers	lamb's-quarters	pigweed, redroot	

6. WHEN USED: 2-6 leaf stage of canola (rapeseed).

## 7. HOW TO APPLY:

**With:** Ground equipment**Rate:** 405-605 mL/ac**Water Volume:** 40 L/ac**Pressure:** 200-275 kPa

8. SPRAYING TIPS: Treat during warm weather when weeds are actively growing.

9. HOW IT WORKS: Absorbed by leaf and stem surfaces and readily translocated. Maximum efficacy results from foliar application to young actively growing plants.

10. EXPECTED RESULTS: Growth will first slow then cease. Death of weed will not occur until 14-21 days after treatment.

11. EFFECTS OF RAINFALL: A rain free period of 4-6 hours is required.

12. MOVEMENT IN SOIL: Small amounts may carry over in soil into the year after treatment, but is generally not mobile in soil under typical prairie conditions.

13. GRAZING AND CROPPING RESTRICTIONS: **Drift:** Small amounts of drift may damage broad-leaved plants. **Rotational Crops Recommended:** Wheat, barley, oats, rye, flax, canola, summerfallow. **Grazing Restrictions:** None. **Succeeding Crops:** Do not seed to crops other than those listed above, the year after treatment.14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats = greater than 5,000 mg/kg. Oral LD<sub>50</sub> bees = greater than 100 ug/bee. Extremely low toxicity to fish.

15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) to reduce exposure. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical attention.

16. STORAGE: Store away from food, feedstuffs, fertilizer, seeds, insecticides, fungicides, or other pesticides. Store in heated storage. If frozen, warm to room temperature and agitate.

# LOROX L (linuron)

DuPont

1. FORMULATION: Flowable suspension - 480 g/L, 10 L container.
2. REGISTERED MIXES: Lorox L+MCPA amine, Lorox L+Atrazine 80W (field corn), Lorox L+Estamine, Lorox L+Sweep+MCPA amine, Lorox L+Target, Lorox L+MCPA-K
3. CROPS:

<b>Lorox L</b>	potatoes (8.7)	<b>Lorox L+MCPA amine</b>
asparagus (8.7)	shelterbelts; fruit trees	500
carrots (8.2)	(apple, pear, plum, cherry)	barley (8.6)
corn, field (6.5)		oats (8.9)
		wheat (spring, durum)(8.2)
4. WEEDS CONTROLLED:

<b>Lorox L</b>	knotweed; kochia (6.4)	<b>Lorox L+MCPA amine</b>
barnyard grass (8.3)	lamb's-quarters (7.9)	500
buckwheat (Tartary, wild)(8.5)	mustard, wormseed (8.9)	buckwheat, Tartary (7.3)
chickweed (9.0)	pigweed (prostrate, redroot)(8.3)	cocklebur
corn spurry (8.7); cow cockle	purslane (8.4); ragweed	common burdock
foxtail (green, yellow)(6.7)	shepherd's-purse	goat's-beard
goosefoot (8.4)	smartweeds, annual (9.0)	hemp-nettle (7.5)
groundsel (8.6)	stinkweed (8.5); wild radish	
5. WEEDS SUPPRESSED: Canada thistle (4.4).
6. WHEN USED: **WEEDS:** 1-4 leaf stage. **Green foxtail:** 1-3 leaf stage. **CROPS:** **Asparagus:** immediately after discing, before emergence, may be repeated after last cutting. **Carrots:** Post-emergence; 2 or more fully developed true leaves, 10-15 cm tall. **Cereals:** 2-4 leaf stage. **Corn:** Pre-emergence Lorox L+Atrazine. Post-emergence Lorox L alone after corn is at least 38 cm tall, directed spray. **Fruit trees:** Apply as directed spray under trees and bushes before buds open and before weeds 10 cm tall. **Potatoes:** Pre-emergence; before grassy weeds 8 cm tall, broad-leaf weeds 15 cm tall. **Shelterbelts:** Apply only on stock planted for as least 1 year as directed spray under trees and bushes before buds open and before weeds 10 cm tall. **Fallow:** Once per season in spring when weeds 2-4 leaf.
7. HOW TO APPLY:

**With:** Ground equipment or air.  
**Rate:** **Asparagus:** Pre-emergence (crop) 1.4-1.8 L/ac in 120 L water/ac. **Carrots:** Pre-emergence (crop) 450-1375 mL/ac in 80-120 L water/ac. Post-emergence (crop) 0.9-1.8 L/ac in 80-120 L water/ac. Combination pre-emergence and post-emergence (crop) 450-1900 mL/ac followed by 0.9-1.8 L/ac, provided treatments are at least 2 weeks apart. **Cereals:** Lorox L 170-225 mL/ac+MCPA amine 345-445 mL/ac. **Corn (field):** Pre-emergence; (a) low organic soils (2% or less) Lorox L - 0.9 L/ac+Atrazine 80W - 0.6 kg/ac, (b) medium organic soils (2-5%) Lorox L - 1.3 L/ac+Atrazine 80W - 0.9 kg/ac. Post-emergence; Lorox L 1.0-1.8 L/ac+oil water emulsion as directed spray. **Fruit trees:** single application of 3.6 L/ac Lorox L+surfactant in 160-240 L/ac water. **Potatoes:** Pre-emergence (crop) 0.9-1.8 L/ac in 120 L water/ac. **Shelterbelts:** single application 1.8 L/ac. **Fallow:** Lorox L at 210 mL/ac+MCPA+Sweep at recommended rates.  
**Water Volume:** 40 L/ac minimum  
**Incorporation:** Not applicable  
**Pressure:** 275 kPa  
**Nozzles:** Do no use flood-jet type.
8. SPRAYING TIPS: Use 50 mesh line strainers and screens. Shake container thoroughly before adding to spray tank. Fruit trees - avoid contact with fruit, foliage, and green bark with spray or drift as injury may result.
9. HOW IT WORKS: A systemic herbicide absorbed by leaves and roots. Yellowing (chlorosis), stunting and finally death occurs 10-14 days after treatment.
10. EXPECTED RESULTS: **Weeds:** Yellowing starts 7-10 days after application. Effect greatest under excellent growing conditions. Weed control will vary depending on species, time of application and growing conditions. **Crop:** A slight yellowing of crop and leaf tip and leaf margin burn may be seen 7-10 days after application. Crop recovers within 14-18 days. Crop injury can occur if applied during period of high heat.
11. EFFECTS OF RAINFALL: Heavy rainfall within 2 hours may decrease activity. Pre-emergent treatment requires rainfall or irrigation for activation.
12. MOVEMENT IN SOIL: Not applicable.
13. GRAZING AND CROPPING RESTRICTIONS: 25% carryover into next growing season if rates are 1.8 L/ac or higher. Do not feed or graze green material.
14. TOXICITY: Low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (1,500). Very toxic to fish; non-toxic to bees.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical attention.
16. STORAGE: Lorox L - Store in a heated area. Do not freeze as settling may occur. If frozen, thoroughly mix to resuspend.

**MATAVEN (flamprop-methyl)**

Ciba-Geigy



CAUTION POISON

1. FORMULATIONS: Emulsifiable concentrate, 84 g/L; 2X10 L container.
2. REGISTERED MIXES: Mataven + Glean (Wheat only) Mixing instructions: With agitator running add Glean to 1/2 the required amount of water, some more water, then Mataven, then the remainder of water. Ensure that Glean is completely in suspension before adding Mataven. Mataven only: add Mataven to 1/2 of water required, agitate, then add rest of water.
3. CROPS:
 

canary grass (8.7)	<b>Forage crops grown for seed production only</b>	fescue, creeping red (9.0)	trefoil, bird's-foot
triticale	alfalfa (8.3)	fescue, meadow (8.5)	wheatgrass, crested (8.3)
wheat (durum, winter, spring)(except Selkirk)(8.9)	bromegrass (8.6)	milk vetch, cicer	wheatgrass, intermediate (9.0)
sunflower	clover, red	ryegrass, Russian wild (8.7)	
		sainfoin	
4. WEEDS CONTROLLED: Wild oats (8.0)
5. WEEDS SUPPRESSED: None
6. WHEN USED: 3 leaf to shot blade stage of wild oats; wild oats at 2 leaf stage and younger may escape control and may grow to maturity. Do not apply beyond 6 leaf stage of the crop. Apply tank mix when wild oats in 3-4 leaf stage.
7. HOW TO APPLY:
 

**With:** Aircraft or ground equipment. Do not apply Mataven + Glean tank mix by air.

**Rate:** 2 L/ac or 2-3 L/ac with grass forage crops using the high rate when forage crops are grown without a companion crop and the low rate when grown with wheat as a companion crop. 2.0 L/ac Mataven + 6-12 g/ac Glean (wheat only).

**Water Volume:** Aircraft - minimum - 8 L/ac; Ground - 40 L/ac.

**Pressure:** 300 kPa (ground).
8. SPRAYING TIPS:
  - (a) Best results will be obtained when the majority of wild oats are at the 3-4 leaf stage, but before the shot blade stage.
  - (b) Allow 4-day interval between the application of Mataven and the use of MCPA, Torch, Blagal, Buctril M or Brominal M and an interval of 7 days with the use of 2,4-D or Banvel formulations.
  - (c) The 40 L/ac spray volume will provide better control of wild oats, especially where there is a heavy crop canopy or dense growth of wild oats.
  - (d) Direct spray pattern 45° forward to enhance spray penetration.
  - (e) Agitation required to re-emulsify spray if allowed to stand for several hours.
9. HOW IT WORKS: A systemic herbicide absorbed through leaves and translocated to the growing point. Cell elongation is inhibited and cell initiation and division is impaired. The wild oat is killed, or stunted so that it is unable to compete with crop.
10. EXPECTED RESULTS: Initially a dark blue-green color appears 10 days after spraying then the wild oats turn yellow and brown. Wild oats in the 1-2 leaf stage at application may often appear controlled but may escape and grow to maturity. Will be small, stunted plants with few shrivelled seeds.
11. EFFECTS OF RAINFALL: Rainfall within 2 hours of application will reduce effectiveness.
12. MOVEMENT IN SOIL: Not applicable.
13. GRAZING AND CROPPING RESTRICTIONS: **Drift:** Drift potential is low. Oats would be the most seriously affected crop. **Grazing Restrictions:** Do not graze treated areas. **Crop Use After Hail:** Do not graze or feed to livestock. **Succeeding Crops:** No restrictions.
14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (5,000). Eye irritant Non-toxic to bees.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) plus goggles when handling this product. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - do NOT induce vomiting. Get medical attention.
16. STORAGE: Heated storage is recommended. If frozen, warm and agitate to resuspend.

**MCPA (amine, ester, salts)****Numerous Trade Names****WARNING POISON**

1. FORMULATIONS: MCPA amine - 500 g/L; MCPA ester - 500 g/L; MCPA Potassium salt - 400 mL; MCPA Sodium salt - 300 g/L in 20 L containers. Phenoxylene Plus - 250 g/L as sodium and potassium salts - 20 L container.

**2. REGISTERED MIXES:**

- (a) MCPA amine + Afolan F, Banvel, Lexone, Lorox L, Pardner, Sencor, Sweep, TCA, Torch
- (b) MCPA ester + Avenge, Pardner, Sweep, Torch
- (c) MCPA Potassium Salt + Banvel
- (d) MCPA Sodium Salt + TCA
- (e) Some formulations can be mixed with liquid fertilizers (28-0-0).

Mixing restrictions: Insure that the proper formulation of MCPA is used with the product considered for mixing.

**3. CROPS:****MCPA amine**

hard red spring (8.7), durum, winter wheat; barley (8.7); oats (9.0); fall rye; flax (8.5); asparagus; peas (field and processing); pastures; non-cropland

Underseeding: Not recommended

**MCPA ester**

hard red spring (8.7), winter wheat; barley (8.0); oats (9); rye; flax; pastures; non-cropland

**MCPA K-Salt**

Wheat; barley; oats; flax; rye; field corn

**MCPA Na-Salt**

wheat; barley; oats; flax; rye; asparagus; peas; pasture; non-cropland

**4. WEEDS CONTROLLED:****MCPA amine**

American dragonhead; biennial wormwood; bluebur; cocklebur; common burdock; flixweed; goat's-beard; goosefoot; hairy galinsoga; lamb's-quarter; mustard (ball, dog, hare's-ear, tumble, wild, wormseed); peppergrass, common; pigweed (redroot, Russian); purslane; ragweed, common; stinkweed; thyme-leaved spurge

**MCPA ester**

lamb's-quarters (8.5); mustard (ball, hare's-ear, tumble, wild, wormseed); ragweed, common; stinkweed (8.3)

**MCPA K-Salt**

lamb's-quarters (8.5); mustard (ball, hare's-ear, wild, wormseed); ragweed, common; stinkweed (8.3)

**MCPA Na-Salt**

Same as for potassium

**5. WEEDS SUPPRESSED:****MCPA amine**

Annual smartweed (4.9); buckwheat (Tartary (4.3), wild (4.7); Canada thistle; hemp-nettle (5.8); knapweed, Russian; leafy spurge; plantain, common; shepherd's-purse; sow-thistle (annual, perennial); wild radish

**MCPA ester**

same as amine and pigweed (redroot, Russian)

**MCPA K-Salt**

bluebur plus weeds shown under MCPA amine and ester

**MCPA Na-Salt**

Same as for potassium

**6. WHEN USED:****Crop**

barley; oats; spring

wheat;

winter wheat; fall rye

flax

peas

asparagus

pastures

**MCPA amine**

4 leaf to just before

flag leaf stage

Before crop tillering in the spring

When crop is 10-18 cm high

Following cultivation just before first spears appear. May repeat at end of cutting season

**MCPA ester**

4 leaf to just before

flag leaf stage

Before crop tillering in the spring

From 5 cm to just before bud formation

Not recommended

Before growth of legumes and grasses begins in the spring

**MCPA K-Salt**

2-6 leaf stage

Not recommended

5-10 cm high

Not recommended

Not recommended

**MCPA Na-Salt**

4 leaf to just before

flag leaf stage

Before crop tillering in the spring

From 5 cm height to just before bud formation

When crop is 10-18 cm high

Following cultivation just before first spears appear. May repeat at end of cutting season

Before growth of legumes and grasses begins in the spring

## 7. HOW TO APPLY:

**With:** Ground equipment or aircraft

### Rate:

Crop	MCPA amine	MCPA ester	MCPA K-Salt	MCPA Na-Salt
wheat; oats; barley; rye; flax;	280-700 mL/ac*	280-700 mL/ac	600-800 mL/ac	490 mL-1.1 L/ac
fall rye; winter wheat; peas;	280-700 mL/ac	280-700 mL/ac	-	490 mL-1.1 L/ac
pastures; non-cropland	280 mL/ac	-	-	600 mL/ac
Asparagus	450-800 mL/ac	450-800 mL/ac	-	710 mL-1.3 L/ac
	1.4 L/ac	-	-	-

\*When using MCPA (amine) on cereals underseeded with legumes use 280 mL/ac.

**Mixture Rates:** MCPA ester up to 450 L/ac + Avenge 1.4 or 1.7 L/ac. MCPA ester 230 mL/ac + Torch 490-610 mL/ac + Avenge 200C 1.4 or 1.7 L/ac.

**Water Volume:** Aircraft - minimum 8 L/ac. Ground equipment - 40 L for all crops except peas. On peas apply amine in a minimum of 70 L/ac or Na salt in a minimum of 60 L/ac.

**Pressure:** 275 kPa

8. **SPRAYING TIPS:** Do not spray when air temperature is above 27°C. Extremely hard water may reduce performance or cause problems in spraying the product.

9. **HOW IT WORKS:** A systemic herbicide absorbed by leaf and stem surfaces and translocated to the actively growing regions. MCPA disrupts cell division, causing abnormal growth response, thereby affecting respiration and food reserves.

10. **EXPECTED RESULTS:** **Weeds:** Weeds start to twist between 2-20 days after spraying, depending on weather conditions, formulation and weeds. Following the twisting and bending, plants will turn brown and then die. Only emerged weeds will be controlled. **Crops:** Yellowing and thinning of the crop may be noticed if higher than recommended rates are used. **Poor results may occur if:** extremely hard water is used.

11. **EFFECTS OF RAINFALL:** Rain within 2 hours of application will decrease activity.

12. **MOVEMENT IN SOIL:** Readily leached from soil. Longer residual in dry soil.

13. **GRAZING AND CROPPING RESTRICTIONS:** **Drift:** Danger from drift with amine and salts is lower than from esters. **Grazing Restrictions:** Do not graze dairy cattle within 7 days after spraying.

14. **TOXICITY:** Low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (700). Very toxic to fish.

15. **PRECAUTIONS, FIRST AID:** Wear standard protective clothing (see page 2) to reduce exposure. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SALT AND AMINE FORMULATIONS SWALLOWED - induce vomiting (see page 3). IF ESTER FORMULATIONS SWALLOWED - do NOT induce vomiting. Get medical attention in all cases.

16. **STORAGE:** If frozen, warm to 5°C and mix well before using.

**MECOTURF (mecoprop)**  
May and Baker

1. FORMULATIONS: Water soluble 150 g/L; 4 and 8 L container.
2. REGISTERED MIXES: None.
3. CROPS: Wheat (spring, durum) (8.3), barley (9.0), oats, lawns and turf. Underseeding: Not recommended
4. WEEDS CONTROLLED: Black medic, buttercup, clover, chickweed (7.6), corn spurry (7.3), dandelion, plantain, cleavers.
5. WEEDS SUPPRESSED: Canada thistle (4.6)
6. WHEN USED: **Crop:** 3 leaf to early flag leaf stage. **Weeds:** 2-4 leaf stage.
7. HOW TO APPLY:  
**With:** Ground equipment  
**Rate:** Cereals - 2.2-2.8 L/ac. Lawns, turf - 2.2-3.4 L/ac  
**Water Volume:** Cereals - 80-120 L/ac. Lawns, turf - 80-160 L/ac  
**Pressure:** 300 kPa
8. SPRAYING TIPS:
  - (a) Recommended water volume is essential for optimum weed control.
  - (b) Cold weather and drought may cause a delay in weed control action.
9. HOW IT WORKS: A systemic herbicide which disrupts the plant's translocation system causing the accumulation of plant food in the shoots and subsequent starvation of the roots.
10. EXPECTED RESULTS: **Weeds:** Leaf curling and stem twisting should be visible within 4-5 days after spraying. Weeds should be completely dead within 3-4 weeks of application. **Crop:** Deformed heads, missing florets and twisted awns could result if recommendations are not followed or if crop is under stress conditions.
11. EFFECTS OF RAINFALL: Rain within 4-6 hours will reduce effectiveness.
12. MOVEMENT IN SOIL: Not applicable.
13. GRAZING AND CROPPING RESTRICTIONS: **Drift:** Danger of vapor drift is low. **Grazing Restrictions:** Do not graze within 14 days of application. **Crop Use After Hail:** No restrictions if 14 days after application. **Succeeding Crops:** No restrictions.
14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (1,060).
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) to reduce exposure. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical attention.
16. STORAGE: Store above 0°C. If stored for 1 year or longer, shake well before using.

**PARDNER (bromoxynil)**

May and Baker



WARNING POISON

1. FORMULATIONS: Emulsifiable Concentrate; 280 g/L, 8 L
2. REGISTERED MIXES: Avenge alone and with MCPA ester, 2,4-D (amine or ester), MCPA (amine or ester), Hoe-Grass 284, MCPA-K, Roundup, Atrazine, TCA. **Mixing restrictions:** Add amine 2,4-D; MCPA; MCPA-K or Atrazine to water first and then add Pardner. Do not use oil or surfactant when mixing Atrazine.
3. CROPS:
 

barley (9.0)	triticale (8.9)	<b>Seedling grasses</b>	reed canary grass
canary grass (9.0)	wheat, durum (8.9)	<b>grown for seed</b>	Russian wild rye (9.0)
corn, field (9.0)	wheat, spring (8.9)	bromegrass	wheatgrass (8.5)
corn, sweet (7.9)	wheat, winter	fescue, meadow (8.3)	(crested, intermediate,
flax (8.6)	zero till	orchard grass (8.9)	slender, tall)

 Underseeding to legumes not recommended.
4. WEEDS CONTROLLED:
 

buckwheat	cow cockle (7.0)	lamb's-quarters (8.4)	smartweeds, annual (8.1)
(Tartary, wild)(8.4)	groundsel, common (9.0)	mustard, wild (8.5)	stinkweed (8.4)
catchfly, night-flowering (7.6)	knawel (7.7)	pigweed, redroot (7.9)	thistle, Russian (8.4)
chamomile, scentless (8.7)	kochia (8.2)		
5. WEEDS SUPPRESSED: None
6. WHEN USED: **Weeds:** Seedling to 4 leaf stage except Russian thistle to 5 cm tall. Generally best results if weeds are in seedling stage. **Crops:** Wheat, barley, oats, triticale - 2 leaf to early flag leaf. Use tank mix with 2,4-D on wheat or barley after 4 leaf. Winter wheat, fall rye - first growth to early flag leaf. Winter wheat - fall 2-4 leaf. Corn - used alone or with atrazine - until crop is 25 cm tall, then use alone with drop pipes. Flax when 5-10 cm tall. Canary seed grass - 3-5 leaf. Seedling grasses, grown for seed - 2-4 leaf.
7. HOW TO APPLY: Ground equipment. Spra-coups - not recommended.  
**Rate:** Wheat, barley, oats, corn (field, sweet), canary seed, triticale 400-500 mL/ac. Flax, fall rye, seedling grasses (grown for seed) - 400 mL/ac.  
**Water volume:** 40 L/ac; corn - 60 L/ac.  
**Incorporation:** Not applicable.  
**Pressure:** 275 kPa  
**Nozzles:** Flooding type nozzles not recommended.
8. SPRAYING TIPS: To control scentless chamomile and knawel, spray before 3 leaf stage.
9. HOW IT WORKS: Bromoxynil is a contact herbicide so good coverage is essential. Inhibits respiration and photosynthesis causing death.
10. EXPECTED RESULTS: **Weeds:** turn brown and die within 3-5 days, more rapidly under good growing conditions and when applied to seedling weeds. **Poor results can be expected if:** weeds past 4 leaf stage, poor spray coverage or, lower than recommended rate used. Injury to corn or flax may occur if under stress.
11. EFFECTS OF RAINFALL: None.
12. MOVEMENT IN SOIL: None.
13. GRAZING AND CROPPING RESTRICTIONS: None.
14. TOXICITY: High acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (245). Symptoms of acute poisoning such as stomach cramps, diarrhea, sore throat may appear. Very toxic to fish, snails and slugs.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - do NOT induce vomiting. Get medical attention.
16. STORAGE: Does not require heated storage.

**PATORAN (metobromuron)**  
BASF

1. FORMULATIONS: 50% Wettable Powder, 2.75 kg bag, 670 g/L Flowable, 20 L pail, 400 g/L Flowable, 10 L pail.
2. REGISTERED MIXES: Patoran + Dual Ciba-Geigy 960E
3. CROPS: Potatoes, soy, lima, adzuki, dry and snap beans.
4. WEEDS CONTROLLED:
 

annual bluegrass	green foxtail	pigweed	smartweeds
barnyard grass	groundsel	purslane	stinkweed.
chickweed	lamb's-quarters	ragweed	
corn spurry	mustard	shepherd's-purse	
5. WEEDS SUPPRESSED: Annual grasses.
6. WHEN USED: Post plant but pre-emergent to crop and weeds. - Patoran can be applied either as:
  - (a) A pre-emergent spray in tank mix combination with Dual Ciba-Geigy.
  - (b) A pre-emergent spray preceded by a pre-plant incorporated spray of Dual Ciba-Geigy.
7. HOW TO APPLY:
 

With: Ground equipment

Rate:

Crop	50 WP kg/ac	670 FW L/ac	400 FL L/ac
Potatoes	1.3-2.2	1.0-1.7	1.7-3.4
Soybeans	1.3-1.8	1.0-1.3	1.7-2.2
Adzuki beans	1.1-2.0	0.8-1.7	1.7-2.2
Other beans	1.1-2.0	0.8-1.7	1.4-1.7

Do not use on the bean variety "Slim Green". Use the lower rate for the bean varieties: "Yellow Eye", "Cranberry", "White Kidney", "Light-red Kidney", and "Dark-red Kidney".

Water Volume: 70-140 L/ac with Patoran 670 FW. 120-160 L/ac with Patoran 50 WP. 100-160 L/ac with Patoran 400 FL.

Incorporation: Do not soil-incorporate Patoran.

Pressure: 275 kPa

Nozzles: Nozzle screens should be 50 mesh size or larger.
8. SPRAYING TIPS:
  - (a) Do not let spray tank mixture stand without agitation before use.
  - (b) Keep by-pass line on or near the bottom of spray tank to prevent foaming.
  - (c) Do not apply Patoran to light textured soils of less than 2% organic matter.
9. HOW IT WORKS: Absorbed through the roots, inhibits photosynthesis.
10. EXPECTED RESULTS: Weed emergence will be inhibited or absent. Under dry conditions, some weed emergence and early die back can occur.
11. EFFECTS OF RAINFALL: Enhance efficacy.
12. MOVEMENT IN SOIL: Patoran can be leached on light soils.
13. GRAZING AND CROPPING RESTRICTIONS: Not applicable.
14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (5,000). Non-toxic to fish and birds; slightly toxic to bees.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) to reduce skin exposure. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). Get medical attention for eyes. IF SWALLOWED - induce vomiting (see page 3). Get immediate medical attention.
16. STORAGE: Flowable formulations should be kept in warm storage. If frozen, warm thoroughly then agitate to resuspend.

**POAST (sethoxydim)**

BASF



WARNING POISON

1. FORMULATIONS: Emulsifiable concentrate 184 g/L; 2 X 7 L + 1 X 7 L of Assist.
2. REGISTERED MIXES: Poast + Buctril M or Brominal M or Bromox 720 or Sabre. Poast + MCPA (amine or ester). Poast + Bladex (triazine tolerant canola only). Poast + Lontrel, Poast + Torch, Poast + Pardner.
3. CROPS: Canola (including triazine tolerant varieties), flax, soybeans, sugar beets, dry beans, snap beans, dry peas, dry bulb onions, tomatoes, potatoes.
4. WEEDS CONTROLLED:
 

barley (8.5)	corn (7.0)	oats (volunteer, wild)(8.4)	wheat (8.4)
barnyard, grass (8.6)	foxtail (green, yellow)(8.3)	Persian darnel (8.7)	quackgrass
5. WEEDS SUPPRESSED: Not applicable.
6. WHEN USED: Control weeds in the 1-6 leaf stage but optimum timing is 2-5 leaf (10-15 cm in height).
7. HOW TO APPLY: Assist Oil Concentrate must be added to all applications of Poast.
 

**With:** Ground or air.

**Rate:** Green and yellow foxtail, barnyard grass, wild proso millet, Persian darnel - 325 mL/ac. Wild oats - 570 mL/ac; heavy infestations 650 mL/ac. Wheat, oats, barley - 650 mL/ac. For heavy infestations of barley - 770 mL/ac. Quackgrass - 1.78 L/ac. With 810 g/ac of Amsul and 2% Assist Oil Concentrate, rate can be lowered to 1.1 L/ac.

**Water Volume:**

Ground Application	Air Application
20-45 L/ac + 200-400 mL/ac Assist	10-20 L/ac + 200-400 mL/ac Assist
45-80 L/ac + 810 mL/ac Assist	

**Pressure:** 275-425 kPa

**Nozzles:** Flat fan nozzles are optimum. Do not use flood jet or hollow cone nozzles.
8. SPRAYING TIPS:
  - (a) Tilt nozzles forward 45° for better coverage.
  - (b) Treat when weedy grasses are actively growing, there is good soil moisture and the crop is small enough to permit thorough spray coverage.
  - (c) Mixing instructions: With agitator running, fill the spray tank with 1/2 required amount of water. Add Poast, then broadleaf herbicide, if tank mixing. Add Assist Oil Concentrate, then remainder of water.
  - (d) Thoroughly clean the sprayer after use by flushing with water and detergent.
  - (e) Allow 4 days between the application of Poast and any other chemical.
  - (f) Control of grasses growing under drought, flooding or prolonged cool temperatures under 15°C, may be reduced or delayed. Escapes or re-tillering may occur under prolonged stress conditions. DO NOT APPLY ON GRASSES STRESSED LONGER THAN 20 DAYS DUE TO LACK OF MOISTURE AS UNSATISFACTORY CONTROL WILL RESULT.
9. HOW IT WORKS: Absorbed by foliage and translocated to the growing points. Inhibits certain vital metabolic processes in these tissues.
10. EXPECTED RESULTS: Weeds stop growing immediately, gradually turn brown and die within 7-21 days. In wide row crops, cultivation may be necessary to control grasses emerging after treatment. Allow at least 7 days between application and cultivation.
11. EFFECTS OF RAINFALL: Rainfall 1 hour after application will not reduce effectiveness.
12. MOVEMENT IN SOIL: Not applicable.
13. GRAZING AND CROPPING RESTRICTIONS: Do not graze treated fields or harvest for feed prior to crop maturity. No restriction on succeeding crops.
14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = formulation (2,500). Causes moderate skin and eye irritation. Low toxicity to birds, fish and bees. Hazards to the environment are low because of rapid breakdown in soil.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) plus goggles to reduce skin and eye exposure. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). Get medical attention immediately for eyes. IF SWALLOWED - do NOT induce vomiting. Get immediate medical attention.
16. STORAGE: Store product in a cool, dry place. Freezing will not reduce effectiveness.

**PRIMATOL (atrazine)**

Ciba-Geigy

1. FORMULATIONS: 80% wettable powder - 25 kg pack, Liquid 500 g/L atrazine - 10 L pack
2. REGISTERED MIXES: Primatol with diuron + simazine; 2,4-D; simazine; paraquat.
3. CROPS: Non-crop land only.
4. WEEDS CONTROLLED: Non-selective.
5. WEEDS SUPPRESSED: Horsetail, milkweed.
6. WHEN USED: April and May OR August to freeze-up. **NOTE:** Spring application can be extended into June, sometimes July, if soil moisture is plentiful, or paraquat is added.
7. HOW TO APPLY:  
**With:** High volume equipment.  
**Rate:** 8.9-18.2 L/ac (liquid) or 5.75-11.5 kg/ac (WP)  
**Incorporation:** See "Soil Sterilants" page 4.
8. SPRAYING TIPS: See "Soil Sterilants" page 4.
9. HOW IT WORKS: Primatol is taken up mainly by roots and to a lesser degree through foliage.
10. EXPECTED RESULTS: Weeds fail to emerge or, die back soon after emergence.
11. EFFECTS OF RAINFALL: Moderate rainfall can enhance performance. Very heavy rainfall on sandy soils can cause leaching and thus a decrease in efficacy.
12. MOVEMENT IN SOIL: Low solubility, low leachability, but there may be some physical movement on sloping ground.
13. GRAZING AND CROPPING RESTRICTIONS: Not applicable.
14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = active ingredient (3,080). May cause eye irritation. Non-toxic to fish and birds; may be toxic to bees.
15. PRECAUTIONS, FIRST AID: Do not spray on foraging bees. Wear standard protective clothing (see page 2) including goggles. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical attention.
16. STORAGE: In a dry location.

**PRIMEXTRA (metolachlor + atrazine)**

Ciba-Geigy

1. FORMULATIONS: Flowable - metolachlor - 300 g/L + atrazine - 190 g/L + related active triazines - 10 g/L - 2 X 10 L pack, 1 X 110 L.
2. REGISTERED MIXES: Nitrogen fertilizer solutions may replace all or part of the water carrier. Dry granular phosphate fertilizers may be impregnated with Primextra.
3. CROPS: Corn (field, silage, sweet).
4. WEEDS CONTROLLED:

buckwheat, wild	lamb's-quarters	pigweed (prostrate, redroot)	smartweeds, annual
foxtail (green, yellow)	mustard, wild	purslane	witchgrass
grass, barnyard		ragweed	
5. WEEDS SUPPRESSED: None
6. WHEN USED: Spring applied - pre-plant incorporated or banded. Pre-emergent (under irrigation only).
7. HOW TO APPLY:

**With:** Ground equipment  
**Rate:** 2.6-3.4 L/ac  
**Water Volume:** 60-120 L/ac  
**Incorporation:** Broadcast and lightly harrow before planting. Do not exceed 5 cm depth. Band treatment: mount a press wheel ahead of the nozzle to level the band.  
**Pressure:** 200-300 kPa
8. SPRAYING TIPS:
  - (a) Add chemical while filling tank with water - gently agitate while filling, mixing, spraying.
  - (b) Use metal filters and screens 50 mesh or larger.
  - (c) Dry granular fertilizer may be impregnated for pre-plant, incorporated application.
9. HOW IT WORKS: Absorbed by roots and inhibits photosynthesis.
10. EXPECTED RESULTS: Weeds die at germination or under dry conditions die-back soon after emergence.
11. EFFECT OF RAINFALL: Enhances results.
12. MOVEMENT IN SOIL: Negligible lateral movement.
13. GRAZING AND CROPPING RESTRICTIONS: Follow corn with corn only.
14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (3,100). May cause severe skin irritation and perhaps eye injury. Low toxicity to fish and birds.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) and goggles. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical attention.
16. STORAGE: Dry heated storage preferred. If frozen, warm to room temperature and agitate.

**PRINCEP (simazine)**  
Ciba-Geigy

1. FORMULATIONS: Princep Nine-T (water dispersible granule) - 89% simazine + 1% related triazines - 4.5 kg pack.
2. REGISTERED MIXES: None
3. CROPS:

alfalfa, established	blueberries, high bush	pears	tree plantings, forest &
apples	corn (field, sweet)	raspberries	Christmas
asparagus	loganberries	shelterbelts	trefoil, bird's-foot (established)
blackberries	nursery stock	strawberries	woody ornamentals, establishe
4. WEEDS CONTROLLED: Princep controls both broad-leaf and grassy weeds, including seedling perennial weeds.
5. WEEDS SUPPRESSED: None
6. WHEN USED: Princep should be used prior to or during weed emergence and may be applied in either the spring or fall, prior to freeze-up.
7. HOW TO APPLY:

With: Ground equipment as standard farm sprayer and a Cyclone spreader or other mechanical applicator when using the granular.

Rate:  
*Princep Nine-T (on established stands only)*  
Nursery stock: 1-1.5 kg/ac. Shelterbelts: 2-3 kg/ac (both - fall or spring prior to weed emergence). Christmas tree and woodland plantations: 2-2.8 kg/ac. Alfalfa and Bird's-foot trefoil: 0.45 kg/ac (late fall). Corn 0.6-1 kg/ac (within 3 days of seeding). Asparagus, blackberries and blueberries: 1-1.5 kg/ac. (early spring). Raspberries: 0.8-1 kg/ac. (early spring but not on young shoots). Loganberry: 1.5-2.4 kg/ac. Bearing and non-bearing apples and pears: 1-2 kg/ac (spring - prior to weed emergence).

Water Volume: 120 L/ac for Princep Nine-T except 200 L/ac for shelterbelts.

Incorporation: In corn, Princep may be applied 1 week before seeding and incorporated to a depth of 2.5 cm.

Pressure: 275 kPa
8. SPRAYING TIPS: Princep Nine-T - Gentle agitation required during mixing and spraying. Use nozzle screens of 50 mesh or larger. After any break in the spray application, agitate thoroughly. See "Soil Sterilants" page 4. - For this use.
9. HOW IT WORKS: Princep acts through the roots of germinating weeds and inhibit photosynthesis.
10. EXPECTED RESULTS: Weed free ground.
11. EFFECTS OF RAINFALL: Negligible
12. MOVEMENT IN SOIL: Very little movement is possible on clay soil but on sandy ground with high rainfall some leaching may occur.
13. GRAZING AND CROPPING RESTRICTIONS: Allow 30 days between application and grazing of dairy, beef cattle, and sheep and 60 days between application and cutting for hay. After spraying with Princep Nine-T do not plant any crop in the treated area in the same year except corn.
14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (5,000). May be irritating to eyes and cause dermatitis.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) and goggles when using. IF IN EYES or ON SKIN - use standard first aid measures (see page 3).
16. STORAGE: Store in dry area, heating not required.

**REGLONE (diquat)**

Chipman



DANGER POISON

1. FORMULATIONS: Water soluble solution, 200 g/L; 5 L container.
2. REGISTERED MIXES: Reglone + Agral 90 (surfactant). Mixing with other pesticides: Not recommended
3. CROPS:
 

alfalfa	clover (red, Dutch, white)	peas	sunflowers, all
beans (red, kidney, white, soy, Adzuki)	flax	potatoes	trefoil, bird's-foot
	mustard	rapeseed	
4. WEEDS CONTROLLED: Non-selective for green vegetation, used for weed control and crop desiccation for harvest.
5. WEEDS SUPPRESSED: Not applicable
6. WHEN USED: For crop desiccation. **Rapeseed**: By aircraft when 60-75% of the seeds have turned from green to brown. **Mustard**: By aircraft when 75% of the seeds have turned. **Flaxseed**: By aircraft when crop has reached 75% ball turn. **Sunflowers**: Apply by aircraft at 20-50% moisture. **Field or Dry Peas**: By aircraft when the crop is mature. Treatment will not mature peas but will kill green weeds in the crop. **Potato Vines**: Spray 2 weeks before harvest, by air or ground. **Alfalfa, Bird's-foot Trefoil, Red and White Clover grown for Seed**: By air no more than 7 days prior to harvest. **Beans (red, white, kidney, soy, adzuki)**: Apply by ground or air when 80-90% of natural leaf defoliation of the bean plants has occurred. Treatment does not mature beans but removes green weeds.
7. HOW TO APPLY:
 

**With**: Aircraft or ground equipment. Booms on ground equipment must be high enough to ensure proper coverage of foliage.

**Rate**: **Rapeseed, Mustard**: light stands, maturing evenly and fields free from weeds, use 810 mL/ac in 20 L/ac water. Heavy stands on fields which contain weeds, use 1.1 L/ac in 20 L/ac of water. Add Agral 90 at 1 L/1,000 L of spray mixture. Argentine varieties should only be desiccated to facilitate harvest of lodged crops. Losses can occur due to pod drop and shatter from handling, and under unfavorable weather conditions. Polish varieties may be straight combined.

**Sunflowers**: Apply at 600 mL/ac in 20 L of water. Add Agral 90 at 1 L/1,000 L of spray mixture. **Flax**: light stands maturing evenly and field is free from weeds. Use 810 mL/ac in 20 L/ac of water. Heavy or weedy stands, or fields with variation in growth, use 1.1 L/ac in 20 L/ac of clean water. Use Agral 90 at 1 L/1,000 L of spray mixture. **Peas**: If green weeds are present use 810-1100 mL/ac in 20 L/ac of water. Use Agral 90 at 1 L/1,000 L of spray mixture. **Alfalfa, Bird's-foot Trefoil, Red and White Clover Grown for Seed**: Use 810-1130 mL/ac in 90-180 L/ac of water. Use Agral 90 at 1 L/1,000 L of spray mixture. **Beans**: Apply 810 mL/ac where weed infestation is light to moderate. In moderate to heavy weed infestation, use 1.1 L/ac. Use at least 120 L/ac of water. Use Agral 90 at 1 L/1,000 L of spray mixture.

**Water Volume**: Aircraft - minimum 8 L/ac; Ground - 100-400 L/ac.

**Pressure**: 275-400 kPa

**Ground Speed**: 9 km/h

**Nozzles**: All types.
8. SPRAYING TIPS:
  - (a) Higher spray volumes generally give better results.
  - (b) Applications made on cloudy days or just prior to or during periods of darkness will increase effectiveness.
  - (c) Muddy water will reduce effectiveness.
9. HOW IT WORKS: Reglone is absorbed by all leaf and stem surfaces, non-systemic. Interferes with photosynthesis.
- WARNING: User must be aware that Reglone speeds up crop maturity. In case of adverse weather (heavy rain, hail or strong winds) the resultant damage to crops may be enhanced.
10. EXPECTED RESULTS: **Weeds**: Fast and virtually complete top kill of annual weeds. Yellowing starts within a few hours of application. Desiccation of the plant will continue rapidly till death. **Crops**: Leaf kill will occur within a few days of application. Stem fall will take longer depending on the crop, but harvesting should normally commence within 7-14 days.
11. EFFECTS OF RAINFALL: No effect once the spray solution has dried.
12. MOVEMENT IN SOIL: Not applicable.
13. GRAZING AND CROPPING RESTRICTIONS: No waiting period after use before straw may be fed to livestock.
14. TOXICITY: Very high acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (230). **Has the potential to cause eye damage, if eyes are constantly exposed**. May cause oral and nasal irritation shortly after use. Does not cause lung damage.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) plus a respirator, goggles and gloves. **IF IN EYES or ON SKIN** - use standard first aid measures (see page 3). Get medical attention for eyes immediately. **IF SWALLOWED** - induce vomiting (see page 3). Get medical attention immediately.
16. STORAGE: Heated storage is necessary.

**RIVAL (trifluralin)**

Hoechst

**(Cereals)**

1. FORMULATIONS: Rival: Emulsifiable concentrate 500 g/L, 9 L: 10% Granular (Rival 10G).
2. REGISTERED MIXES: With Avadex BW, Liquid Fertilizer, and Avadex BW + Liquid Fertilizer.  
**Mix Restrictions:** Add Rival or Rival + Avadex directly into the liquid fertilizer, mix thoroughly and apply as soon as possible. Agitate until application is complete.
3. CROPS: Wheat (spring and durum), barley.  
Underseeding: Not recommended.
4. WEEDS CONTROLLED: Green and yellow foxtail.
5. WEEDS SUPPRESSED: None
6. WHEN USED: Apply alone or as a tank mix with Avadex BW in the spring after seeding and prior to emergence of wheat or barley.
7. HOW TO APPLY:  
**With:** Ground Equipment  
**Rate:** 485 mL/ac on light to medium textured soil. 650 mL/ac on heavy textured soil.  
**Water Volume:** 40 L/ac  
**Incorporation:** Incorporate 2-4 cm with 2 cross harrowings with tine or diamond harrows operated at a speed of at least 9 km/h. Both incorporations should be done within 24 hours of application.  
**Pressure:** 275 kPa
8. SPRAYING TIPS: Apply only on fields that are trash free or summerfallow fields. Crop must be seeded 5-8 cm deep in a well tilled seedbed to prevent contact between the chemical and the seed.
9. HOW IT WORKS: Acts on both the root and shoot tips as they emerge. Prevents cell division and affected plants die before emergence. If the shoot portion of the plant escapes to the soil surface, lateral or secondary root growth is inhibited causing a slow death since the plant is unable to gather moisture or nutrients.
10. EXPECTED RESULTS: **Green Foxtail:** Seeds that germinate below the treated layer will produce plants that will emerge. The secondary root system of plants that form within the treated layer is completely inhibited by trifluralin present in that area. The affected plant dies slowly as crop competition and temperature stress over-tax the rootless plant's ability to take up moisture. **Crop:** injury is minimized when seeded to a depth of 5-8 cm.
11. EFFECTS OF RAINFALL: No effect once incorporated into the soil.
12. MOVEMENT IN SOIL: None.
13. GRAZING AND CROPPING RESTRICTIONS: None.
14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (6,150). In clean water, fish are very sensitive to trifluralin; but in runoff and muddy water, trifluralin binds to the suspended soil particles and large amounts can be tolerated by fish. Non-toxic to bees.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - do NOT induce vomiting. Get medical attention.
16. STORAGE: Do not store below 0°C. If stored below 0°C, bring the contents to 15°C for 24 hours and shake well before using. Do not store near heat, spark or open flame.
17. SPECIAL USE: Rival 10G only on barley - **Fall application only.**
  - (a) When used: Fall application only: Between September 1 and freeze-up.
  - (b) How to Apply: See Rival 10G under Rival - oilseed.
  - (c) Rate: Light soils (2-4% O.M.) - 3.4 kg/ac; medium or heavy soils (4-6% O.M.) - 4.5 kg/ac. Medium or heavy soils (6-10% O.M.) - 5.7 kg/ac.
  - (d) Warning: Do not apply Rival 10G for barley on land treated with trifluralin products since June 1 of the previous year. Do not apply to soils with more than 10% O.M. or less than 2% O.M. Seeding should be done into a warm, moist seedbed. Avoid seeding in cold soil.
  - (e) Caution: Do not apply to soils subject to erosion.

## RIVAL (trifluralin)

Hoechst

### (Oilseeds, Special Crops, Vegetable Crops)

1. FORMULATIONS: Emulsifiable concentrate 500 g/L, 9 L. 10% Granular (Rival 10G).
2. REGISTERED MIXES: Rival + Liquid Nitrogen Fertilizer (28-0-0). (Pour directly into liquid fertilizer, mix thoroughly and apply as soon as possible with constant agitation.)

#### 3. CROPS:

Rival	flax
alfalfa, seeded	lentils*
beans (black-kidney, lima, snap, white)	mustard, tame
cabbage (seeded, transplants)	ornamentals**
canola, traizine tolerant	peas (canning, field)
carrots	soybeans
cauliflower (seeded, transplants)	turnips
crambe	woody nursery stock, perennials
fababeans	

\* Fall application only. \*\*Spring application

Underseeding: Not recommended.

#### Transplants

broccoli	Rival 10G
brussel sprouts	canola
peppers	flax
tomatoes	lentils*
<b>Transplanted Shelter Belts**</b>	
ash, green	mustard
caragana	peas (canning, field)
elm (American, Siberian)	sunflowers
pine, Scotch	

#### 4. WEEDS CONTROLLED:

bromegrass, downy	foxtail (green, yellow)(8.1)	lamb's-quarters (8.0)	purslane
buckwheat, wild (8.3)	grass (annual blue,	oats, wild (7.5)	thistle, Russian (7.9)
chickweed (7.1)	barnyard (8.3)	Persian darnel	wheatgrass
cow cockle (9.0)	knotweed	pigweed (8.2)	

#### 5. WEEDS SUPPRESSED: None.

6. WHEN USED: **Spring application:** cultivate to destroy existing weeds and apply pre-plant. **Fall application:** September 1st to freeze-up. Fall incorporation is discouraged where soil drifting is a problem. **Summer application:** On summerfallow between June 1st to September 1st. **Special Instructions for Lentils:** Not recommended for spring application. Both incorporations of Rival or Rival 10G must be done in the fall. Shallowly till and pack the soil in the spring to ensure a firm seedbed and an accurate depth for seeding. **Special Instructions for flax:** Summer and fall application only.

#### 7. HOW TO APPLY:

**With:** Ground equipment

**Rate:** **Spring Application** - (a) Rival: 650 mL/ac; on sandy soils less than 6% organic matter. (b) Rival: 890 mL/ac; on medium or heavy textured soils, 6-15% organic matter, and low to medium wild oat infestations. For heavy wild oat infestations apply Rival: 1.1 L/ac.

**Fall Application** - (a) Rival: 890 mL/ac. Rival 10G: 4.5 kg/ac; on sandy soils less than 6% organic matter. (b) Rival: 1.1 L/ac. Rival 10G: 5.7 kg/ac; on medium or heavy textured soils, 6-15% organic matter, and low to medium wild oat infestations. For heavy wild oat infestation apply Rival at 1.4 L/ac or Rival 10G at 6.9 kg/ac.

**Summer Application** - Between June 1st and September 1st Rival: 1.4 L/ac. Rival 10G: 5.7 kg/ac on light soils; 6.9 kg/ac on medium or heavy soils.

**Water Volume:** 40 L/ac

**Incorporation:** First incorporation at a right angle must be done within 24 hours of application. A tandem disc, discer or field (vibra shank) cultivator are recommended for incorporating to 8-10 cm. To get the best mixing action, operate the disc implement at 6-10 km/h and the cultivator at 10-13 km/h. Deep tillage cultivators are not recommended.

**Pressure:** 275 kPa

8. SPRAYING TIPS: Use on soils with less than 20-25% straw cover. On stubble, chop and thoroughly mix residues and weed growth into the soil before application.

A tandem disc mixes best on stubble or poor condition soils (crusted, lumpy or wet). Fall application should be followed with 2 incorporations at right angles, before freeze-up. This or a summer application should be preceded by a light spring tillage to a 5-8 cm depth before seeding.

Do not apply on soils that are wet, in poor tilth, or contain 15% + organic matter. To avoid concentrating wild oat seeds below the treated layer, do not plow land prior to trifluralin application.

9. HOW IT WORKS: Trifluralin kills seedlings as they germinate. Inhibits cell division in the actively growing points of the root and shoot.

10. EXPECTED RESULTS: **Weeds:** Most weeds die before emerging. Weeds will exhibit swelling in the coleoptile region, stubby, thick primary root development and lack of secondary roots, which leads to death due to inadequate moisture obtaining ability. **Crop:** Seed flax into a well packed warm moist seedbed. Do not seed deeper than 4 cm.

11. EFFECTS OF RAINFALL: No effect once trifluralin is incorporated into the soil.

12. MOVEMENT IN SOIL: None.

13. GRAZING AND CROPPING RESTRICTIONS: None. **Crop Use After Hail:** No restrictions **Succeeding Crops:** Normally, trifluralin carry over will not harm crops grown in rotation. As a precaution, oats, sugar beets and small seeded annual

grasses should not be grown in rotation following a trifluralin treated crop. Alfalfa and most clovers are tolerant to trifluralin. Drought conditions in the year of treatment may result in higher levels of trifluralin carry-over into the next year. To avoid wheat injury, seed less than 7 cm deep into a warm moist seedbed.

14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (75,000). In clean water, fish are very sensitive to trifluralin, but in run off or muddy water, it binds to soil particles and large amounts can be tolerated by fish. Non-toxic to bees.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - do NOT induce vomiting. Get medical attention.
16. STORAGE: Do not store below 0°C. If stored below 0°C, bring the contents to 15°C for 24 hours and shake well before using. Do not store near heat, spark or open flame.

**ROUNDUP (glyphosate)**  
Monsanto

1. FORMULATIONS: Water soluble solution 356 g/L; 1, 4 or 10 L container.
2. REGISTERED MIXES: **Zero Till:** Roundup + Torch + registered non-ionic surfactant. **Chemical Fallow:** Roundup + 2,4-D amine (or Banvel or Torch) + registered non-ionic surfactant. Mixing with other pesticides: Not recommended
3. CROPS: A non-selective herbicide used for pre-plant, pre-emergence or for spot application in certain crops.
4. WEEDS CONTROLLED:  

<b>Annuals</b>	<b>Perennials</b>	<b>Deciduous brush</b>
bluegrass, annual (9.0)	mustard	bindweed, field (7.2)
bromegrass, downy	oats, wild	bluegrass (Canada, Kentucky)(9.0)
buckwheat, wild (6.7)	ragweed	bromegrass, smooth
foxtail, green (7.9)	shepherd's-purse	cattail
knotweed	smartweeds, annual	cress, hoary
kochia	sow-thistle	curled dock
lamb's-quarters	thistle, Russian	milkweed
lettuce, prickly	vetch	quackgrass
		sow-thistle, perennial
		thistle, Canada (7.8)
		toadflax (8.5)
		wormwood
5. WEEDS SUPPRESSED: Many
6. WHEN USED: Canada thistle must be 20-25 cm + in height and up to the early heading or bud stage or in the fall rosette stage. Quackgrass - 8-10 cm in height. Other perennials at the early head or early bud stage. The low rate controls annual weeds 6-7 cm in height. Apply to deciduous brush in June, July, and August. Registered mixes are recommended for controlling annual weeds in chemical-fallow or zero-till situations.
7. HOW TO APPLY:  
**With:** Ground equipment only. **Do not use in galvanized steel or unlined steel tanks.**  
**Rate:** Perennial weeds: **Bindweed (field)** - 2.8-4.9 L/ac **Canada thistle** - 1.9-2.8 L/ac **Canada thistle (rosette stage)** - 1.0 L/ac in the fall after summerfallow **Milkweed (common)** - 4.9 L/ac **Quackgrass** - 1.9-2.8 L/ac **Quackgrass (fall only)** - Post-harvest when regrowth has 3-4 leaves - 1.0 L/ac **Other perennials** - 2.8-4.9 L/ac **Annual Broadleaf:** 900-1400 mL/ac **Annual Grasses:** 300-400 mL/ac **Brush:** 4 L/ac **Minimum or zero tillage systems:** 450-575 mL/ac  
**Water Volume:** Handgun and high volume equipment - use coarse sprays only at 80-120 L/ac. Boom equipment - 40-120 L/ac Chemical Fallow and Reduced Rates: 20-40 L/ac  
**Pressure:** 275 kPa  
**Nozzles:** Flat fan nozzles for volumes 20-40 L/ac - flood jet type or flat fan for volumes above 40 L/ac
8. SPRAYING TIPS: **Quackgrass:** apply 4-6 weeks after swathing. Sod-bound quackgrass may require follow-up treatment. Frost of -5°C will be tolerated by new shoots. Frost damage to growing shoots could reduce control and the field should be left untilled for spring treatment. Frost damage is evident by the drying of new shoots shortly after the frost. Apply in spring or fall to quackgrass that is in the 3-4 leaf stage (8-10 cm of new growth) for season long control - use 1 L/ac. **Canada thistle (rosette stage):** (15 cm in diameter or 5 weeks old) in the fall on summerfallow using 1 L/ac. Allow 5 or more days after application before tillage.
9. HOW IT WORKS: Roundup is a systemic herbicide which moves from the foliage into the roots and kills the entire plant.
10. EXPECTED RESULTS: Wilting and yellowing of annual weeds occur within 2-4 days, perennial weeds require 7-10 days. Complete browning of above ground growth and deterioration of roots occurs. Cool or cloudy weather may slow the activity and delay visual effects.
11. EFFECTS OF RAINFALL: Rainfall within 6 hours after application may reduce effectiveness. Heavy rainfall within 2 hours after application may wash the chemical off the foliage and require retreatment.
12. MOVEMENT IN SOIL: Not applicable
13. GRAZING AND CROPPING RESTRICTIONS: Not applicable.
14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (4,320). Eye irritant. Non-toxic to birds, fish and bees.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) and goggles to reduce skin and eye exposure. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical attention.
16. STORAGE: Heated storage not required.



1. FORMULATIONS: Emulsifiable concentrate - bromoxynil 360 g/L + MCPA 360 g/L. Container size: Sabre - 12.5 L; Bromox 720 - 6.25 L.

2. REGISTERED MIXES: Avenge, MCPA Ester, Poast + Assist.

**Mixing restrictions:**

- (a) With MCPA - with agitator running add bromoxynil to 1/2 of the water then add rest of water and MCPA.
- (b) With Avenge - As above, adding Avenge last.
- (c) With Poast - As in (a) adding Sabre or Bromox 720 last.

3. CROPS:

Spring wheat (8.6), barley (8.8), oats (8.8), flax (8.4), canary seed (8.5), durum wheat, winter wheat, fall rye.  
 Underseeding: Not recommended.

4. WEEDS CONTROLLED:

bluebur	flixweed	mustard (8.4)	shepherd's-purse
buckwheat	groundsel, common	(ball, tumble, wild, wormseed)	smartweeds, annual (8.2)
(Tartary, wild (8.1))	hemp-nettle*	night-flowering catchfly	stinkweed (8.9)
chamomile, scentless (7.6)	knawel	pigweed, redroot (7.9)	sunflower, volunteer
cocklebur	kochia (6.7)	ragweed, common	thistle, Russian (7.4)
cow cockle (7.8)	lamb's-quarters (8.6)	rapeseed, volunteer (8.7)	

\* Tank mix with MCPA.

5. WEEDS SUPPRESSED: Canada thistle and perennial sow-thistle.

6. WHEN USED: Cereals; 2 leaf to early flag leaf. Winter wheat, fall rye; after growth begins in spring to early flag leaf. Canary seed; 3-5 leaf. Flax; 5-10 cm.

7. HOW TO APPLY:

**With:** Ground equipment or air.

**Rate:** 315 mL/ac.

**Water Volume:** Ground Equipment: 20 or more L/ac. Air: 8 or more L/ac.

**Pressure:** 275 kPa

**Nozzles:** No flood tips.

8. SPRAYING TIPS:

(a) Avoid spraying during a severe drought. Under conditions of high temperature and humidity, slight discolouration of cereals may occur but no effect on crop yields.

(b) Flax is less tolerant than cereals, therefore do not spray flax in hot humid weather when day time temperatures are over 25-29°C.

(c) Best results are achieved when weeds are sprayed in seedling stage, with good spray coverage.

9. HOW IT WORKS: Bromoxynil is a contact type herbicide, therefore, good spray coverage is essential. Inhibits photosynthesis and plant respiration. MCPA is absorbed through leaves and is readily translocated in the plant.

10. EXPECTED RESULTS: Small burnt spots on the leaf can appear within hours, complete death takes up to 2 weeks. **Poor results may be expected if:** Poor coverage. Poor penetration through crop canopy.

11. EFFECTS OF RAINFALL: No effect.

12. MOVEMENT IN SOIL: Not applicable.

13. GRAZING AND CROPPING RESTRICTIONS: No grazing or crop use restrictions.

14. TOXICITY: High mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (365). Very toxic to fish and birds; non-toxic to bees

15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - Do NOT induce vomiting. Get medical attention.

16. STORAGE: Does not require heated storage.

# SENCOR (metribuzin)

Chemagro

1. FORMULATIONS: 500 Flowable 500 g/L; 5 L jugs, 4 jugs/case. 750 water dispersable granule (sprayule). 750 g active/kg; 3 kg jugs, 4 jugs/case.
2. REGISTERED MIXES: Cereals: Sencor+Banvel; 2,4-D; MCPA amine; or Target. Potatoes: Sencor+Eptam. Fababeans+triazine tolerant Canola: Sencor+Treflan (see Spectrum).
3. CROPS:

alfalfa	canola, triazine tolerant	lentils (7.8)	potatoes (8.6)
barley (8.9)	fababeans (8.6)	peas, field	wheat, spring (8.5)
Underseeding: Do not underseed.			
4. WEEDS CONTROLLED:

buckwheat, Tartery (5.3)	groundsel, common	lamb's-quarters (8.4)	smartweed, green (8.5)
catchfly, night-flowering	hemp-nettle (8.4)	mustard (ball, wild, wormseed) (8.0)	stinkweed (8.2)
chickweed (8.1)	henbit (8.0)	pigweed, redroot (7.4)	thistle, Russian (7.2)
corn spurry (7.1)	lady's-thumb	rapeseed, volunteer (non-triazine tolerant)(8.8)	
5. WEEDS SUPPRESSED: Canada thistle and sow-thistle with the 2,4-D, MCPA and Banvel mixes.
6. WHEN USED: **Wheat and Barley:** Sencor alone - 2-5 leaf stage. Sencor+Banvel - 2-3 leaf stage of barley, - 2-4 leaf stage of wheat. Sencor+2,4-D amine - 3-5 leaf stage. Sencor+MCPA amine - 3-5 leaf stage. Sencor+Target - Barley - 2-3 leaf stage, Wheat - 2-5 leaf stage. **Potatoes:** Sencor alone - before weeds are 4 cm high. Sencor+Eptam - pre-plant incorporated. **Fababeans:** Sencor+Treflan - pre-plant incorporated. **Lentils and Peas:** Sencor alone - Before vines are 15 cm long and after weeds have emerged but less than 5 cm. Do not use if soil has less than 4% organic matter. **Alfalfa (Grown under irrigation):** Sencor - Apply to dormant established stands of alfalfa in the fall. Injury may occur to alfalfa if Sencor is applied earlier than 18 months after seeding. **Triazine Tolerant Canola:** Sencor alone - before weeds are 5 cm high. Sencor+Treflan - pre-plant incorporated, fall or spring.
7. HOW TO APPLY: Do not tank mix with any other pesticide, wetting agent or surfactant. Do not apply within 3 days after periods of cool, wet or cloudy weather, else crop injury may occur. Do not apply more than once per season. Crops, with the exception of triazine tolerant canola, must be planted at least 5 cm below the soil surface.  
**With:** Ground equipment  
**Rate:** **Barley:** 110-225 mL/ac of 500 flowable alone or tank-mixed with 350-440 mL/ac of MCPA or 2,4-D amine 500 or tank-mixed at 110-170 mL/ac of Sencor with 110 mL/ac of Banvel 400 or tank mixed at 400-600 mL/ac of Target.  
**Klondike, Leduc, and Johnston barley:** 110-170 mL/ac of 500 F or 110 mL/ac of 500 F tank-mixed with MCPA amine. Do not apply Sencor plus Banvel; 2,4-D or Target. **Wheat:** 110-170 mL/ac of 500 F alone or tank-mixed with 345-440 mL/ac of MCPA or 2,4-D amine 500 or tank-mixed with 110 mL/ac of Banvel 400 or tank mixed with 400-600 mL/ac of Target.  
**Lentils:** 170 mL/ac of 500 F applied as a post-emergence broadcast spray in at least 70 L/ac of water. **Peas:** 170-225 mL/ac of 500 F applied as a post-emergence broadcast spray in at least 70 L/ac of water. **Potatoes:** 225 mL/ac of 500 F applied early post-emergence. **Under irrigation:** 225-910 mL/ac (maximum) applied early post-emergence. **Irrigation or dryland:** 225-345 mL/ac (maximum) of 500 F tank-mixed with 1.7-2.2 L/ac of Eptam 800 as a pre-plant incorporated treatment. **Fababeans:** **Spring Application**, 325-345 mL/ac of 500 F tank-mixed with 600-800 mL/ac of Treflan 545 EC as a pre-plant incorporated treatment. **Fall Application**, 345 mL/ac of 500 F tank-mixed with 800-1050 mL/ac of Treflan 545 EC as a pre-plant incorporated treatment. **Alfalfa (Under irrigation only):** 910 mL/ac of 500 F as a dormant fall application. **Triazine Tolerant Canola:** 170 mL/ac of 500 F applied as a post-emergent broadcast spray in at least 70 L/ac of water. **Spring Application**, on light soils, with less than 6% O.M., 175-225 mL/ac of 500 F+600 mL/ac of Treflan. On medium or heavy soils, 6-15% O.M., 225-345 mL/ac of 500 F+800-1100 mL/ac of Treflan 545 EC as a pre-plant incorporated treatment. **Fall Application**, on light soils, with less than 6% O.M., 225-285 mL/ac of 500 F+800 mL/ac of Treflan. On medium or heavy soils, 6-15% O.M., 285-345 mL/ac of 500 F+1.1-1.3 L/ac of Treflan 545 EC as a pre-plant incorporated treatment.  
**Water Volume:** 40 L/ac - except 70 L/ac for lentils, peas and post emergent on triazine tolerant canola.  
**Incorporation:** For Sencor+Eptam on potatoes refer to Eptam. For Sencor+Treflan on fababeans and triazine tolerant canola refer to Treflan and Spectrum.  
**Pressure:** 200-275 kPa
8. SPRAYING TIPS: Shake container thoroughly before adding to sprayer tank. Allow a 4-5 day interval between the application of Sencor and post-emergent wild oat herbicides. Weed control may be reduced if Sencor is applied later than the 5 leaf stage of crop. Allow 4-5 days after frost for crop to recover before applying Sencor. Crop may be sprayed when wet with dew. Lentils and Peas - apply only once per crop season. Crop must be planted at least 5 cm below the soil surface. Tilt nozzles 45° forward for better spray penetration.
9. HOW IT WORKS: A systemic herbicide absorbed by leaves and roots and translocated to new growth. Inhibits photosynthesis and the weed turns brown and dies.
10. EXPECTED RESULTS: **Broad-leaf Weeds:** Initial yellowing 5-7 days after application, weeds turn brown and die within 14-16 days. Sencor is active in the soil for a short period and can control new shallow-rooted germinants, like chickweed. **Crop:** Under certain environmental conditions, like extremely hot weather or frost that occurs within 1-2 days of application, the crop will show some yellowing and slight reduction in height. Discolouration disappears in 7-10 days. On Klondike, Johnston

and Leduc barley varieties, temporary lightening in crop colour and reduction in crop height may occur. Lentils and peas provide little competition against weed growth due to their low growth habit. Under heavy weed infestations or lush growth, control may be poor.

11. EFFECTS OF RAINFALL: Rainfall within 6 hours after application may reduce weed control.
12. MOVEMENT IN SOIL: Little leaching occurs in soils with high organic matter.
13. GRAZING AND CROPPING RESTRICTIONS: Do not graze or feed treated crop to livestock within 30 days of application (lentils and peas - 70 days) *Crops*: Do not harvest for grain within 60 days of application (lentils and peas - 70 days, canola - 75 days).
14. TOXICITY: Low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (1,100). Slightly toxic to fish and birds.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) when working with the product to avoid exposure. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical attention.
16. STORAGE: No damage by freezing but avoid large temperature fluctuations. Store in a cool dry place.

**SIMMAPRIM (simazine)**

Ciba-Geigy

1. FORMULATIONS: Wettable powder - 80% - 25 kg pack.
2. REGISTERED MIXES: Simmaprim with amitrol, atrazine, atrazine + diuron, paraquat, sodium chlorate, and sodium metaborate.
3. CROPS: Total weed control and bare ground maintenance on non-crop land.
4. WEEDS CONTROLLED: Most annual and perennial broad-leaf weeds and grasses. Horsetail, milkweed and sedges may require more than 1 treatment.
5. WEEDS SUPPRESSED: Not applicable
6. WHEN USED: Apply before or during weed emergence. Can be applied in fall before freeze up for control of perennial weeds.
7. HOW TO APPLY:  
**With:** High volume application equipment.  
**Rate:** 5.7-11.5 kg/ac  
**Incorporation:** See "Soil Sterilants" page 4.
8. SPRAYING TIPS: See "Soil Sterilants" page 4.
9. HOW IT WORKS: Absorbed through roots only.
10. EXPECTED RESULTS: Failure of weeds to emerge or, depending on weather conditions, weeds may die back after emergence.
11. EFFECTS OF RAINFALL: Average rainfall can enhance performance.
12. MOVEMENT IN SOIL: Movement in the soil is negligible.
13. GRAZING AND CROPPING RESTRICTIONS: Not applicable - for use on non-crop land.
14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (5,000). May be irritating to eyes and cause dermatitis.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) and goggles to reduce skin and eye exposure.  
IF IN EYES or ON SKIN - use standard first aid measures (see page 3).
16. STORAGE: Store in dry area. Heating not required.

**SINBAR (terbacil)**

DuPont

1. FORMULATIONS: Wettable powder - 80% - 2 kg pack.
2. REGISTERED MIXES: None.
3. CROPS: Alfalfa (forage and seed) (8.6). After crop established for 1 growing season.
4. WEEDS CONTROLLED:

barley, wild (7.5)	foxtail, green (7.3)	lettuce, prickly	ryegrass, perennial
bluegrass, annual (8.6)	grass, barnyard (7.2)	mustard, wild	shepherd's-purse (9.0)
brome, downy	henbit	pigweed, redroot (8.0)	stinkweed (9.0)
chickweed, common (8.6)	lamb's-quarters (8.9)	ragweed, common	thistle, annual sow (8.4)
dandelion (6.5)			
5. WEEDS SUPPRESSED: Dandelion (less than 2 years old), quackgrass
6. WHEN USED: Preferably after alfalfa becomes dormant in fall or before growth begins in spring.
7. HOW TO APPLY:

**With:** Ground equipment.  
**Rate:** 285-610 g/ac - lower rate on light soils, higher rate on heavier soils.  
**Water Volume:** 80 L/ac  
**Incorporation:** Not applicable.  
**Pressure:** 275 kPa
8. SPRAYING TIPS:
  - (a) Use metal filters, line strainers and screens no finer than 50 mesh.
  - (b) Continuous tank agitation required.
  - (c) To reduce crop injury, do not use on soils with less than 1% organic matter.
9. HOW IT WORKS: Absorbed by roots and inhibits photosynthesis.
10. EXPECTED RESULTS: **Weeds:** Kills germinating weeds. Any that emerge will yellow and die. **Crop:** No effect on alfalfa if it is dormant at time of application. **Poor results may be expected if:** Too little moisture for activation, uneven coverage, rate too low for soil type.
11. EFFECT OF RAINFALL: Moderate rainfall is desirable.
12. MOVEMENT IN SOIL: Some movement under light soil and high moisture conditions.
13. GRAZING AND CROPPING RESTRICTIONS: **Drift:** Most crops sensitive. **Succeeding Crops:** Seed no crop within 2 years of last treatment.
14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (5,000). Non-toxic to bees.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN - use standard first aid measures (see page 3).
16. STORAGE: Cool, dry storage.

SODIUM TCA  
Hoechst



CAUTION POISON

1. FORMULATION: 85% granule in 25 kg bags. 500 g/L, 20 L.
2. REGISTERED MIXES: Sodium TCA + 2,4-D amine; MCPA amine; MCPA sodium salt; Buctril M.
3. CROPS:

barley (9.0)	cabbage	flax (8.6)	oats
beets, red	canola (8.7)	non-crop land	peas, field (7.0)
beets, sugar	cauliflower		
4. WEEDS CONTROLLED: Green foxtail (6.9), yellow foxtail (6.9), spruce, balsam, fir, pine.
5. WEEDS SUPPRESSED: Quackgrass, Kentucky blue, smooth bromegrass.
6. WHEN USED: Foxtail - 1-3 leaf stage; Quackgrass - no stage limitation. Oats, barley, canola, flax - 2-4 leaf. Field peas - 10-20 cm tall. Sugar beets - pre or post-emergent before 4 leaf. Red beets - pre-emergent. Cabbage and cauliflower - pre-emergent or directed post-emergent. Flax - 10-15 cm tall.
7. HOW TO APPLY:

With: Ground equipment

Rate: **Flax, rapeseed, field peas:** 1.8 kg/ac, 3.1 L/ac. **Barley:** 500 g/ac, 870 mL/ac in 32-40 L/ac of water. **Oats:** 500 g/ac - 1.1 kg/ac, 0.87-1.9 L/ac in 32-40 L/ac of water. **Sugar beets:** 1.8 kg/ac, 3.1 L/ac post-emergent, - 2.5-4 kg/ac, 2.3-6.9 L/ac pre-emergent, in 40-80 L/ac water. **Red beets:** 2.5-4 kg/ac, 2.3-6.9 L/ac.

Non-Selective: **Quackgrass:** 44.5 kg/ac, 75.7 L/ac. **Quackgrass patches (undisturbed):** 100-125 g/10 m<sup>2</sup>, 0.2-2.1 L/10 m<sup>2</sup> **Quackgrass patches (with cultivation):** 75-100 g/10 m<sup>2</sup>, 130-150 mL/10 m<sup>2</sup> **Kentucky blue, smooth bromegrass suppression:** 5-7 kg/ac, 8.6-12.1 L/ac **Spruce, balsam fir, pine:** 20-25 kg/1000 L of water, 13.8-16.2 L/ac **Pavement maintenance:** 2.5 kg/100 m<sup>2</sup>, 4.25 L/100 m<sup>2</sup>

Water Volume: 40-60 L/ac in all cases except for woody plant control. Apply to point of run-off for spruce, fir and pines.

Incorporation: For quackgrass cultivate or disc thoroughly after application.

Pressure: 275 kPa

Nozzles: Flat fan nozzles, use minimum 50 mesh screens.
8. SPRAYING TIPS:
  - (a) Flush sprayer thoroughly after each use to prevent corrosion.
  - (b) Agitate to dissolve TCA.
  - (c) Stainless steel nozzles are recommended due to corrosiveness.
  - (d) When mixing spray, put 10 L of water in the tank for each kg of TCA.
  - (e) Ensure that TCA is dissolved before adding another herbicide.
  - (f) Plant barley and oats at least 5 cm deep to avoid crop injury.
9. HOW IT WORKS: Absorbed more readily through roots than foliage. Precipitates proteins in the plants and disrupts the membranes.
10. EXPECTED RESULTS: Leaves die and plant dries up. Chlorosis, then browning of the leaf tips, growth retardation and eventual death. **Poor results may be expected if:** the soil is dry at application time and for a 2-3 week period after or there is inadequate mixing.
11. EFFECTS OF RAINFALL: A light rain after application is beneficial for activation. Heavy rain may wash TCA off foliage.
12. MOVEMENT IN SOIL: Movement is greater in light, sandy soils.
13. GRAZING AND CROPPING RESTRICTIONS: **Grazing restrictions:** Do not feed tops of sugar or red beets to livestock. Do not allow animals to graze treated areas. Do not contaminate water bodies.
14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (3,320). Skin and eye irritant. Non-toxic to birds and fish.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) plus goggles and gloves to reduce exposure. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). Get medical attention.
16. STORAGE: Dry storage, no effect from freezing. A minimum of 2 years shelf life.

# SPECTRUM (metribuzin + trifluralin tank mix)

Chemagro/Elanco

1. FORMULATIONS: One 4.8 L jug of Sencor 500 F flowable 500 g/L packed with two 8.5 L jugs of Treflan 545 EC emulsifiable concentrate 545 g/L for tank mixing.
2. REGISTERED MIXES: Sencor 500 F + Treflan 545 EC.
3. CROPS: Triazine Tolerant Canola (8.4). NON-TRIAZINE TOLERANT RAPESEED WILL BE KILLED BY THIS COMBINATION. Do not underseed.
4. WEEDS CONTROLLED:

bluegrass, annual	darnel, Persian	lady's-thumb (6.7)	rapeseed, volunteer
brome, downy	foxtail (green (8.5), yellow)	lamb's-quarters (8.0)	(non-triazine tolerant (6.9)
bromegrass	grass, barnyard	mustard, wild (7.6)	shepherd's-purse
buckwheat, wild (7.4)	hemp-nettle (8.9)	oats, wild	smartweed, green (8.7)
chickweed	knotweed	pigweed, redroot	stinkweed (8.7)
cow cockle		purslane	thistle, Russian

5. WEEDS SUPPRESSED: None.

6. WHEN USED: **Spring application:** cultivate to destroy existing weeds and apply prior to planting crop in the spring. **Fall application:** apply in the fall (September 1 to freeze-up). **NOTE:** Fall incorporation should be discouraged wherever soil drifting is a problem.

7. HOW TO APPLY: With ground equipment.

Rate:

Soil Characteristics	Spring Application		Fall Application	
	Treflan 545 EC	+ Sencor 500 F	Treflan 545 EC	+ Sencor 500 F
<b>Light textured soils</b>				
2-3% Organic matter	600 mL/ac	+	175 mL/ac	800 mL/ac
3-6% Organic matter	600 mL/ac	+	225 mL/ac	800 mL/ac
<b>Medium or heavy textured soils</b>				
6-10% Organic matter	800-1100 mL/ac*	+	225-350 mL/ac	1.1-1.3 L/ac**
10-15% Organic matter	800-1100 mL/ac*	+	350 mL/ac	1.1-1.3 L/ac**

\* Use the 1.1 L/ac rate of Treflan 545 EC when there is a heavy wild oat infestation.

\*\* Use the 1.3 L/ac rate of Treflan 545 EC when there is a heavy wild oat infestation.

**NOTE:** Mix the Sencor in the tank before adding the Treflan. Continually agitate until all the mixture is sprayed. Do not allow the sprayer to stand without agitation.

**Water Volume:** Minimum of 40 L/ac

**Incorporation:** Apply to the soil and incorporate in the same operation, if possible. Must be incorporated within 24 hours after application. Work twice in different directions. Use a tandem disc, discer or vibrashank type cultivator to cut 8-10 cm deep. Operate disc implements at 7-10 km/h and cultivators at 10-13 km/h.

**Pressure:** 275 kPa

8. SPRAYING TIPS:

- (a) Cultivate to destroy existing weeds before application. When applying to stubble fields, chop and thoroughly mix crop residues into soil to a depth of 10-15 cm. Disc type implements provide the best results. To avoid concentrating wild oat seeds below the treated layer, and causing soil erosion, do not plow (moldboard) land prior to application.
- (b) Do not use on soils with less than 2% or more than 15% organic matter. On variable soils with light sandy areas, some injury may occur on the sandy areas if the rate used is for the heavier soil type. On soils with 10% organic matter and higher, broadleaf weed control may not be adequate. Do not apply to wet soils or soils subjected to periods of flooding. Do not incorporate with a field cultivator when the soil is crusted, lumpy or too wet for good mixing action.
- (c) Triazine Tolerant Canola is sensitive to deep seeding so seedbed should be shallowly tilled and packed just prior to seeding in the spring to ensure a firm seedbed and accurate depth of planting.

9. HOW IT WORKS: See Treflan and Sencor.

10. EXPECTED RESULTS: See Treflan and Sencor. **Crop:** Only for Triazine Tolerant canola. Stress such as disease, cold, deep planting, excessive moisture, high salts or drought may weaken canola seedlings and increase the possibility of damage. Temporary lightening on the margins of cotyledons and a slight delay in crop development may occur.

11. EFFECTS OF RAINFALL: Rainfall does not affect Treflan activity once incorporated. Sencor can be leached in sandy soils.

12. MOVEMENT IN SOIL: Treflan is not leached in soil. Sencor can be leached in soils with low clay and/or organic matter.

13. GRAZING AND CROPPING RESTRICTIONS: Do not graze or feed treated crop within 30 days of application. Do not harvest for grain for 75 days after treatment. **Succeeding Crops:** Vegetable crops and rapeseed (Non-triazine Tolerant) are sensitive to Sencor and may be injured if planted in Sencor treated soil in the application year and the next. After harvest, tillage that provides thorough mixing of the soil may reduce the chance of injury to succeeding crops. As a precaution oats, sugar beets and small-seeded annual grasses such as timothy, canary seed and creeping red fescue, should not be grown in rotation following a Treflan treated crop. Drought conditions in the year of a Treflan treated crop may result in higher levels of Treflan carry-over into the next year. To reduce wheat injury seed less than 7 cm into warm moist

seedbed.

14. TOXICITY: See Treflan and Sencor.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - do NOT induce vomiting. Get medical attention.
16. STORAGE: See Treflan and Sencor.

**SPIKE (tebuthiuron)**

Elanco



WARNING POISON

1. FORMULATIONS: 80% wettable powder (Spike 80W) - 2 kg bag or 20 kg box (Spike 5G) - 7 kg shakes box or 20 kg drum.
2. REGISTERED MIXES: None  
Mix restrictions: Not applicable  
Mixing with other pesticides: Not recommended
3. CROPS: Non-cropland only.
4. WEEDS CONTROLLED: Total vegetation control.
5. WEEDS SUPPRESSED: Not applicable
6. WHEN USED: Use throughout the growing season and up to September 15th. Best if applied early in spring.
7. HOW TO APPLY:
  - (a) **Spike 5G**  
With: Shaker box or granular spreader.  
Rate: 44.5-91.0 kg/ac. Apply the higher rates for deep-rooted perennials and for greater residual effect.  
Incorporation: See "Soil Sterilants" page 4.
  - (b) **Spike 80WP**  
With: Ground spray equipment  
Rate: 2.2-4.5 kg/ac. Use higher rates for deep rooted perennial weeds, and for longer term weed control.  
Water Volume: See "Soil Sterilants" page 4.
8. SPRAYING TIPS:
  - (a) Do not apply where bare ground is undesirable, where soil erosion may be a problem, or on areas where the roots of desirable vegetation may extend.
  - (b) Maintain continuous agitation when using Spike 80W.
  - (c) If by-pass agitation is used, the return line should terminate at the bottom of the tank to minimize foaming.
  - (d) Clean application equipment thoroughly after use.
9. HOW IT WORKS: Requires rainfall to move into root zone. Absorbed by roots and inhibits photosynthesis.
10. EXPECTED RESULTS: Vegetation will turn brown and die. Speed of kill will depend on root depth and amount of rainfall. Duration of control will depend upon the amount of chemical applied, soil-type and environmental conditions. **Poor results may be expected from:** inadequate application rate or application onto frozen ground.
11. EFFECTS OF RAINFALL: Rainfall will activate product, by carrying into the root zone.
12. MOVEMENT IN THE SOIL: Once moved into the soil by rainfall, will leach vertically with time.
13. GRAZING AND CROPPING RESTRICTIONS: Spike is non-selective residual herbicide, only used on non-cropland.
14. TOXICITY: Low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (644). Slightly toxic to fish and birds.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN - use standard first aid measures (see page 3).
16. STORAGE: Store in a dry place.

STAMPEDE CM (propanil + MCPA)  
Rohm and Haas



WARNING POISON

1. FORMULATIONS: Emulsifiable concentrate: 360 g/L propanil + 100 g/L low volatile MCPA ester, 11.4 L jug.
2. REGISTERED MIXES: None
3. CROPS: Spring wheat, durum wheat (8.7), barley (8.6), oats (8.9), and flax (8.4), canary seed. Underseeding: Not recommended
4. WEEDS CONTROLLED:

bluebur (7.8)	foxtail (green, yellow)(8.6)	mustard, wild (8.8)	smartweed, annual (8.6)
buckwheat (Tartary (8.6), wild (8.4))	kochia (6.7)	pigweed, redroot (8.8)	shepherd's-purse, rosette (9.0)
flaxweed (7.4)	lamb's-quarters (8.8)	rapeseed, volunteer (8.8)	stinkweed, rosette (8.7)
5. WEEDS SUPPRESSED: None
6. WHEN APPLIED: Apply at the 3-4 leaf stage of green foxtail (under 2.5 cm in height). Under dry conditions (soil moisture is deeper than 5 cm) apply when green foxtail is at the 2-3 leaf stage. Apply at 3-4 leaf of broadleaf weeds and 1-4 leaf of smartweed. Cereal crops must be at the 2-5 leaf stage and flax must be between 5 and 12 cm in height. Do not spray flax when temperatures exceed 30°C.
7. HOW TO APPLY:

With: Ground Equipment only. Spra-coupe not recommended.

Rate: 1.1 L/ac

Water Volume: Field sprayers - 40 L/ac. Floater type equipment - 60 L/ac

Pressure: 275 kPa

Ground Speed: 8 km/h field sprayers, 20 km/h or less for floaters.

Nozzles: Only flat fan nozzles. Flooding nozzles can be used on floaters.
8. SPRAYING TIPS:
  - (a) **Mixing Procedures:** Fill spray tank with 1/2 the required amount of water. Add Stampede CM, engage agitator and add remainder of water. Water used should be 10°C or warmer. Spray Stampede CM within 6 hours of mixing.
  - (b) A 3 day interval is required before or after an application of Stampede CM and another herbicide. If an insecticide treatment is required, use Furadan, and wait a minimum of 5 days after Stampede CM application in wheat and 10 days in barley. For Dimethoate (Cygon) or Malathion allow a minimum interval of 14 days. Decis may be applied anytime before or after a Stampede CM application. Do not apply Stampede CM in fields to which Atrazine has been applied during the previous 2 years. Crops grown from seed treated with dual purpose (fungicide/insecticide) seed dressings may be treated with Stampede CM.
  - (c) Long term crop injury may occur if applied to crop under severe stress or if frost is expected within 24 hours.
  - (d) Under hot, dry and low relative humidity conditions spray during early morning or evening.
  - (e) Apply Stampede CM when temperatures are expected to exceed 10°C.
  - (f) Apply to cereals no later than the 5 leaf stage.
9. HOW IT WORKS: Rapidly absorbed by foliage to cause breakdown of cell walls and cellular metabolism. The MCPA component causes phenoxy-specific symptoms. Activity is essentially contact, and thorough spray coverage is necessary for optimum weed control. Weeds become tolerant beyond the 4 leaf stage as well as under stress conditions.
10. EXPECTED RESULTS: **Weeds:** Within 3-5 days, weeds turn brown and have a "burnt off" or dried out appearance. Weeds past the recommended stage will show extensive desiccation, but some green tissue remains and new growth may be generated enough to recover. Weeds emerging after spraying are unaffected. **Crops:** Temporary yellowing, and leaf tip burn will usually be more noticeable in barley, oats and flax than wheat. These effects disappear 10-14 days after treatment. New growth develops normally and yields are not reduced. Applied under extreme stress conditions, Stampede CM may cause a slight delay in crop maturity, and some suppression of growth in flax. This may be offset by increased yield due to weed control.
11. EFFECTS OF RAINFALL: Rainfall 1 hour after treatment will not affect performance.
12. MOVEMENT IN SOIL: Not applicable
13. GRAZING AND CROPPING RESTRICTIONS: None. **Drift:** Danger is low; MCPA has a low volatility.
14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (1,950). Propanil has potential to cause chlorachne - a skin disease in man following prolonged exposure.
15. PRECAUTIONS, FIRST AID: Symptoms of poisoning may be giddiness, intoxication and headache. Wear standard protective clothing (see page 2) to reduce skin exposure since propanil can cause skin problems. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - do NOT induce vomiting. Get medical attention.
16. STORAGE: Heated storage is not required. If frozen, warm and agitate thoroughly to redissolve crystals.

STAMPEDE 360 (propanil)  
Rohm and Haas



WARNING POISON

1. FORMULATIONS: Emulsifiable concentrate; 360 g/L; 11.4 L.
2. REGISTERED MIXES: Stampede 360+MCPA ester - spring and durum wheat, barley, oats, flax. Stampede 360 - 2,4-D L.V. ester or amine - spring and durum wheat. Stampede 360+Glean - spring and durum wheat, barley (Argyle, Bedford and Klages only).
3. CROPS: Spring wheat (8.8), durum wheat (8.7), barley (8.4), oats (8.9), flax (8.4).
4. WEEDS CONTROLLED:
 

Stampede 360 (alone)	360+MCPA (ester)	360+2,4-D (amine or ester)	360+Glean
buckwheat, Tartary (7.6)	360 weeds +	360 weeds + burdock	360 weeds +
wild (8.0)	bluebur(7.8)	clover, sweet	chickweed
foxtail (green, yellow)(7.3)	flixweed (7.4)	cocklebur	cow cockle (9.0)
lamb's-quarters (8.3)	kochia (6.7)	goat's-beard	flixweed
pigweed, redroot (8.7)	lady's thumb	hawk's-beard,	hempnettle (8.3)
shepherd's-purse (9.0)	rapeseed, volunteer (8.8)	narrow-leaved	kochia (4.8)
smartweeds, annual (8.0)		lettuce, prickly	lady's-thumb
stinkweed (8.1)		pigweed, Russian	mustard, wild (8.0)
		plantain	rapeseed, volunteer (8.1)
		radish, wild	thistle (Canada (6.6),
		sunflower, annual	Russian (6.2))
		thistle, Russian (7.5)	
5. WEEDS SUPPRESSED: None
6. WHEN USED: **Weeds:** Green foxtail 3-4 leaf stage and less than 2.5 cm in height. Under dry conditions apply at the 2-3 leaf stage. **Broadleaf weeds:** 2-4 leaf stage, 1-4 leaf of smartweed. **Crops:** Apply to cereals in the 2-5 leaf stage, with 2,4-D apply to wheat in 3-5 leaf stage. Flax 5-10 cm in height. Application should be made within 17 days of crop emergence (21 days after seeding).
7. HOW TO APPLY:
 

**With:** Ground equipment only. Spra-coupe not recommended.

**Rate:** 1.1 L/ac. When tank mixing, add 220 mL/ac MCPA ester 500 for wheat (spring, durum), barley, oats, flax; 320-480 mL/ac 2,4-D ester 500 or 480 mL/ac 2,4-D amine 500 for spring wheat; 320 mL/ac ester 500 or 480 mL/ac 2,4-D amine 500 for durum wheat; 6-12 g/ac of Glean for wheat (spring, durum) and barley (Argyle, Bedford, Klages).

**Water Volume:** Field sprayers - 40 L/ac. Floater type equipment - 60 L/ac

**Pressure:** 275 kPa

**Ground Speed:** 8 km/h for field sprayers, 20 km/h or less for floaters

**Nozzles:** Only flat fan nozzles. Flooding nozzles can be used on floaters.
8. SPRAYING TIPS:
  - (a) **Mixing Procedures:** Fill tank with 1/2 required amount of water, add MCPA, 2,4-D or Glean, then add Stampede 360. Agitate and continue filling with water to the required volume. Agitate at least 5 minutes immediately before spraying. Water should be 10°C or warmer. Spray the solution within 6 hours of mixing. Drain and flush sprayer tank and lines after spraying is completed.
  - (b) A 3 day interval should be allowed before or after an application of Stampede 360 and another herbicide. If an insecticide treatment is required, use Furadan, waiting a minimum of 5 days after Stampede 360 application in wheat and 10 days in barley. Dimethoate (Cyon TM) or Malathion may also be used, but allow a minimum interval of 14 days following a Stampede 360 application. Decis may be applied anytime before or after a Stampede 360 application. Crops grown from seed treated with dual purpose (fungicide/insecticide) seed dressings may be treated with Stampede 360. Do not apply Stampede 360 in fields to which Atrazine has been applied during the previous 2 years.
  - (c) Long term crop injury may occur if applied to crop under severe stress or if frost is expected within 24 hours.
  - (d) Under hot, dry and low relative humidity conditions, spray during early morning or evening.
  - (e) Apply Stampede 360 when temperatures are expected to exceed 10°C.
  - (f) Apply to cereals no later than the 5 leaf stage.
9. HOW IT WORKS: Stampede 360 is absorbed by leaves and causes cell wall breakdown and interference with the cellular metabolism. Activity is primarily contact, therefore, thorough spray coverage is necessary for optimum weed control. Susceptible weeds become tolerant beyond the 4 leaf stage. Stress conditions will trigger a hardening off process and hasten the development of tolerance to chemical control.
10. EXPECTED RESULTS: **Green foxtail, broad-leaf weeds:** Affected weeds turn brown in 3-5 days and have a "burnt-off", or desiccated, appearance. Weeds past the recommended stage will show extensive browning, but some degree of green, tissue remains. New tissue is produced, and the weed will recover. Weeds emerging after spraying are unaffected. **Crops:** Temporary yellowing and leaf tip burn occur and is more pronounced in oats, flax and barley than in wheat. Effects will disappear 10-14 days after treatment. New growth is not affected and yields are not reduced. Under stress conditions, a slight delay in crop maturity may be noticed.
11. EFFECTS OF RAINFALL: Light rainfall 1 hour after application will not affect performance.

12. MOVEMENT IN SOIL: Not applicable
13. GRAZING AND CROPPING RESTRICTIONS: None.
14. TOXICITY: Slightly high acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = technical (560). Propanil has potential to cause chlorachne - a skin disease in man following long-term exposure.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) to reduce skin exposure. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). Symptoms of poisoning may be giddiness, intoxication and headache. IF SWALLOWED - do NOT induce vomiting. Get medical attention.
16. STORAGE: Heated storage not required. If frozen, warm and agitate thoroughly to redissolve crystals.

**SWEET (paraquat)**

Chipman



1. FORMULATIONS: Water soluble solution 250 g/L; 20 L container.
2. REGISTERED MIXES: With bromoxynil + MCPA; dicamba + 2,4-D; Lorox + MCPA; 2,4-D; MCPA.  
**Mix Restrictions:** With amine formulations use immediately. Mixing with other pesticides: Not applicable.
3. CROPS: Summerfallow Underseeding: Not applicable
4. WEEDS CONTROLLED: Annual grasses and annual broad-leaf weeds when tank-mixed with broad-leaf herbicide.
5. WEEDS SUPPRESSED: Most perennial weeds
6. WHEN USED: At the 2-4 leaf stage of annual weeds.
7. HOW TO APPLY:  
**With:** Ground equipment  
**Rate:** 910 mL/ac for annual grass control.  
**Water Volume:** 45 L/ac. Use higher volumes when foliage is dense or weeds are in the 4 leaf stage.  
**Pressure:** 300 kPa
8. SPRAYING TIPS:
  - (a) Apply Sweep + Lorox + MCPA mix only once per year in spring.
  - (b) Use very clean water as muddy water will inactivate chemical.
  - (c) Applications made on cloudy days, during dull sunlight or periods of darkness will generally increase the effectiveness.
  - (d) Do not apply with mist blowers.
  - (e) Thoroughly wash equipment after spraying.
9. HOW IT WORKS: A contact herbicide absorbed by leaves and stems. Interferes with photosynthesis and causes yellowing and eventual death.
10. EXPECTED RESULTS: **Weeds:** Sweep provides immediate, fast and virtually complete annual grass control. Repeat applications will be necessary when new weeds emerge. Yellowing occurs in a few hours, followed by rapid desiccation and later death. When tank-mixed with a broad-leaf herbicide, most annual weeds will be controlled. Thorough coverage of weeds is essential. **Crop:** Not applicable.
11. EFFECTS OF RAINFALL: No effect once the spray solution has dried on the plant tissue.
12. MOVEMENT IN SOIL: None.
13. GRAZING AND CROPPING RESTRICTIONS: None.
14. TOXICITY: Very high acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (120). May be fatal if swallowed.
15. PRECAUTIONS; FIRST AID: KEEP OUT OF REACH OF CHILDREN AND ANIMALS. Wear standard protective clothing (see page 2) plus a pesticide respirator to avoid skin and lung exposure. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). See a doctor immediately.
16. STORAGE: Never transfer to other containers. Store tightly in original containers and in a safe place. Heated storage.

**TARGET (MCPA + mecoprop + dicamba)**  
Ciba-Geigy



CAUTION POISON

1. FORMULATIONS: Water soluble solution containing 275 g/L MCPA + 62.5 g/L mecoprop + 62.5 g/L dicamba; 2 X 10 L jugs.
2. REGISTERED MIXES: Target + Sencor 500 F, Target + Lorox L or Afolan F, 28-0-0 Liquid nitrogen (winter wheat only).
3. CROPS: Hard red spring and durum wheat (8.4), winter wheat (8.5), barley (8.5), oats (9.0), annual canary grass (8.5). Thistle control on fallow.
4. WEEDS CONTROLLED:

buckwheat	hemp-nettle (7.0)	night-flowering catchfly (7.5)	sow-thistle, annual
(Tartary, wild)(8.0)	knotweed	pigweed (prostrate, redroot)(8.8)	stinkweed (8.4)
cleavers (7.5)	kochia (8.0)	rapeseed, volunteer (8.5)	sunflowers, volunteer (8.0)
corn spurry (8.8)	lamb's-quarters (8.7)	shepherd's-purse	thistle, Russian (8.5)
cow cockle (8.5)	mustards (8.8)	smartweeds, annual (6.3)	
flaxweed			
5. WEEDS SUPPRESSED: Canada thistle, bindweed (field and hedge).
6. WHEN USED: Wheat, oats - 2-5 leaf stage, Barley - 2-3 leaf stage, winter wheat - apply in spring before crop is more than 30 cm tall. Summerfallow - thistles are in the early bud stage. Weed growth stage - 2-5 leaf stage. **NOTE:** Treatment at other than recommended crop stage may cause injury.
7. HOW TO APPLY:  
**With:** Ground equipment.  
**Rate:** 405-610 mL/ac. 610-810 mL/ac on summerfallow for thistle control.  
**Water Volume:** 40 L/ac  
**Pressure:** 275 kPa
8. SPRAYING TIPS:
  - (a) For hemp-nettle control, apply before the second pair of leaves appear.
  - (b) Use the higher rate when weeds are beyond the 3 leaf stage, when weed densities are high or under adverse weather conditions.
  - (c) Use 610 mL/ac rate when cleavers are in the 1-2 whorl stage.
  - (d) In winter wheat, spray winter annuals as soon as growth begins or if 28-0-0 liquid nitrogen is used as the carrier.
  - (e) When using 28-0-0 liquid nitrogen as carrier, use 45 L/ac of total solution. Do not let contents stand for long periods of time without agitation.
9. HOW IT WORKS: Target is a combination of 3 systemic hormonal herbicides which accumulate in the growing point of susceptible plants, produce abnormal growth and disrupt the transport system in plants.
10. EXPECTED RESULTS: **Weeds:** Visible effects occur 7-14 days after treatment. Leaves curl, leaf edges turn brown, petioles twist, plant ceases growth and turns brown and dies. **Crop:** Improper or untimely application can result in abnormal bending at the nodes of grain stalks, difficulty in head emergence from sheath, curled awns, malformed kernels and sterile florets. **Poor results may be expected if:** there is poor coverage, rainfall less than 3 hours after application or weeds too advanced. Dicamba containing products can be hard on crops if incorrectly applied.
11. EFFECTS OF RAINFALL: Rainfall within 3 hours will reduce activity.
12. MOVEMENT IN SOIL: Not applicable.
13. GRAZING AND CROPPING RESTRICTIONS: None. **Drift:** Most vegetables and fruit crops are very sensitive.
14. TOXICITY: Low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (1,028). **Long-term continuous exposure to this product may produce enlarged kidneys.** Non-toxic to fish; toxic to bees.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) to avoid exposure. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical attention.
16. STORAGE: Heated storage only.

**TORCH DS (bromoxynil)**

Union Carbide



WARNING POISON

1. FORMULATIONS: Emulsifiable Concentrate; Torch DS - 450 g/L, 10 L.

## 2. REGISTERED MIXES:

**With:** Avenge alone or with MCPA ester; 2,4-D (amine or ester); MCPA (amine or ester); MCPA-K; Roundup; Atrazine; Hoe-grass 284.

**Mixing restrictions:** Add amine 2,4-D; MCPA or MCPA-K to water first and then add bromoxynil.

## 3. CROPS:

barley (9.0)	triticale (8.9)	<b>Seedling grasses grown for seed</b>	reed canary grass
canary grass (9.0)	wheat, durum (8.9)	bromegrass	Russian wild rye (9.0)
corn, field (9.0)	wheat, spring (8.9)	fescue, meadow (8.3)	timothy
corn, sweet (7.9)	wheat, winter	orchard grass (8.9)	wheatgrass (crested, intermediate, slender, tall)(8.5)
flax (8.6)	zero till		

## 4. WEEDS CONTROLLED:

buckwheat (Tartary, wild)(8.4)	groundsel, common (9.0)	mustard, wild (8.5)
catchfly, night-flowering (7.6)	knawel (7.7)	pigweed, redroot (7.9)
cow cockle (7.9)	kochia (8.2)	smartweeds, annual (8.1)
	lamb's-quarters (8.4)	stinkweed (8.4)
		thistle, Russian (8.4)

## 5. WEEDS SUPPRESSED: None

6. WHEN USED: **Weeds:** Seedling to 4 leaf stage except Russian thistle to 5 cm tall. Generally best results if weeds are in seedling stage. **Crops:** Wheat, barley, oats, triticale - 2 leaf to early flag leaf. Use tank mix with 2,4-D on wheat or barley after 4 leaf. Winter wheat, fall rye - first growth to early flag leaf. Winter wheat - fall - 2 - 4 leaf. Corn - used alone or with atrazine - until crop is 25 cm tall, then use alone with drop pipes. Flax when 5-10 cm tall. Canary seed grass - 3-5 leaf. Seedling grasses, grown for seed - 2-4 leaf.

## 7. HOW TO APPLY: Ground equipment. Spra-coups - not recommended.

**Rate:****Crop**

Wheat, barley, oats, corn (field, sweet), canary seed, triticale

**Torch DS**

250-300 mL/ac

Flax

250 mL/ac

Winter wheat

300 mL/ac

fall rye, seedling grasses (grown for seed)

350 mL/ac

Water volume: 40 L/ac. Corn - 60 L/ac.

Pressure: 275 kPa

Nozzles: Flooding type nozzles not recommended.

## 8. SPRAYING TIPS: To control scentless chamomile and knawel, spray before 3 leaf stage.

## 9. HOW IT WORKS: Bromoxynil is a contact herbicide so good coverage is essential. Inhibits respiration and photosynthesis causing death.

10. EXPECTED RESULTS: **Weeds:** turn brown and die within 3-5 days - more rapid under good growing conditions and when applied to seedling weeds. **Poor results can be expected if:** weeds past 4 leaf stage, poor spray coverage or, lower than recommended rate used. Injury to corn or flax may occur if under stress.

## 11. EFFECTS OF RAINFALL: None.

## 12. MOVEMENT IN SOIL: None.

## 13. GRAZING AND CROPPING RESTRICTIONS: None.

14. TOXICITY: High acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (245). Symptoms of acute poisoning such as stomach cramps, diarrhea, sore throat may appear. Very toxic to fish, snails and slugs.

## 15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) when applying. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - Do NOT induce vomiting. Get medical attention.

## 16. STORAGE: Does not require heated storage.

**TORDON (Industrial) (picloram)**

Dow



CAUTION POISON

Available only to approved personnel.

1. FORMULATIONS: Tordon 10K pellets - 10% picloram - 25 kg. Tordon 22K herbicide - 240 g/L as potassium salt - 18.9 L. Tordon 101 Mixture - picloram - 60 g/L + 2,4-D - 240 g/L, 18.9 L, 205 L.

2. REGISTERED MIXES: None.

3. CROPS: Tordon 10K pellets are registered for brush control. Tordon 101 Mixture for brush control and weeds on rights-of-way. Tordon 22K for controlling deep rooted perennial and biennial weeds on rangeland, permanent grass pastures, non-cropland and for spot treatment on crop land, when applied by an authorized pesticide applicator.

4. WEEDS: Tordon will control most broad-leaved weeds and brush.

5. WEEDS SUPPRESSED: None.

6. WHEN USED: Tordon 101 Mixture and Tordon 22K - applied after leaves are fully expanded until about 3 weeks before frost. Tordon 10K pellets - applied in spring, just before or during periods of vigorous growth.

7. HOW TO APPLY:

**Tordon 10K Pellets**

With: Cyclone spreader, ground operated  
granular spreader, aerial spreader

**Tordon 22 K**

Boom or hand gun

**Tordon 101 Mixture**Ground equipment or helicopter using  
drift control agent.

Rate: 16-30 kg/ac depending upon species

450 mL-3.6 L/ac depending upon  
weed species

Brush - 10 L in 1000 L water and  
spray to point of runoff.  
Weeds - 2.8 L/ac

**Water Volume:** Use 80-800 L/ac of water, depending upon density of growth.

8. SPRAYING TIPS: Spread Tordon 10K Pellets evenly over the ground surface above tree roots. Higher rates may cause grass injury in drier areas of the province.

Tordon 22K used as a spot treatment in a crop. No spot treatment should exceed 1 acre, and the total area treated in any 1 field in a year should not exceed 5% of the total acreage.

**NOTE:** Picloram is extremely persistent and water soluble, and small quantities may cause damage to desirable plants. Do not apply, or permit any Tordon herbicide to contaminate soil used to grow desirable susceptible plants. Do not contaminate water used for irrigation or domestic purposes.

9. HOW IT WORKS: Interferes with cell division, causing leaf cupping, stem distortion and eventual death of plant. Tordon 10K pellets require moisture to carry picloram to the roots. Tordon 101 and 22K are absorbed through leaves and roots.

10. EXPECTED RESULTS: **Tordon 10K Pellets:** 2-3 weeks after the first rainfall after treatment, leaves of affected trees become dull and cupped; orange streaks appear on the stems of poplar trees, leaves become brown and brittle, as the tree dies. **Tordon 101 Mixture:** 2-3 weeks after treatment symptoms as above occur. **Tordon 22K Herbicide:** Perennial weeds show distorted stems and cupped leaves, which turn yellow and then brown. Usually native grass increases in abundance as a result of reduced competition. **Poor results may be expected if:** there is heavy rainfall immediately after treatment on light sandy soil.

11. EFFECTS OF RAINFALL: Heavy rainfall may dissolve and carry picloram away from the target area, or percolate dissolved picloram out of the root zone of target plants.

12. MOVEMENT IN SOIL: Picloram is very soluble in water and moves readily with water.

13. GRAZING AND CROPPING RESTRICTIONS: Manure from picloram treated vegetation should not be used to grow sensitive crops but rather be returned to a cereal crop field. When applied as a spot treatment on cropland, picloram may persist in soil for up to 5 years, and prevent the establishment of sensitive crops. Where wheat, oats, barley and canola are the major crops in the rotation program, the following sequence is suggested to start the year after treatment: **First Year:** Oats or canola. **Second Year:** Oats, canola or barley. **Third Year:** Oats, canola, barley or wheat. A reduction in yield in the first year, is usually offset by benefits of weed control obtained. Legumes may not be established in a pasture for several years after a Tordon herbicide treatment. If legumes are essential in a pasture, do not use Tordon herbicide.

14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = Technical Picloram (8,200); Tordon 10K Pellets (5,000); Tordon 101 Mixture (3,080); Tordon 22K (10,330).

15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN - use standard first aid measures (see page 3).

16. STORAGE: Tordon 10K Pellets: Store in a cool, dry place. Tordon 22K Herbicide and Tordon 101 Mixture: Store in a cool, dry place. Do not freeze. If freezing occurs, bring to room temperature and mix thoroughly.

**TORDON 202C (picloram + 2,4-D)**

Dow



CAUTION POISON

1. FORMULATIONS: Picloram 12 g/L + 2,4-D 200 g/L, 20 L

2. REGISTERED MIXES: None

3. CROPS: Barley (8.7) and wheat (7.7). Underseeding: Not recommended.

4. WEEDS CONTROLLED:

buckwheat, Tartary (4.7)  
buckwheat, wild (7.2)

cocklebur  
dandelion

mustard, wild (8.6)  
pigweed, redroot (7.1)

smartweed, green (5.9)  
stinkweed (seedlings)

5. WEEDS SUPPRESSED: Scentless chamomile, Canada thistle.

6. WHEN USED: 3-5 leaf stage of crop. Seedling (2-4 leaf) stage of weeds.

7. HOW TO APPLY:

With: Ground equipment

Rate: 600-800 mL/ac

Water Volume: 40 L/ac

Pressure: 275 kPa

8. SPRAYING TIPS: Treat during warm weather when the weeds are young and growing actively. Use the maximum rates under dry or cool conditions.

9. HOW IT WORKS: Absorbed by leaf, stem and roots and translocated throughout the plant to the growing points. Some soil residue controls late germinating weeds.

10. EXPECTED RESULTS: Death of weeds is not immediate but growth is slowed and eventually ceases. Under dry conditions straw shortening in wheat may occur, but yield may not be affected.

11. EFFECTS OF RAINFALL: Rainfall within 4-6 hours of application may reduce activity.

12. MOVEMENT IN SOIL: Picloram degrades very slowly in soil and water, and may be leached out, after rainfall, from soils low in organic matter.

13. GRAZING AND CROPPING RESTRICTIONS: **Drift:** Small amounts can damage many desirable broad-leaf plants. **Use of Straw from Treated Fields:** Do not use straw from treated crops for compost or mulching on susceptible broad-leaf crops. If straw is used for bedding or animal feed return the manure to fields to be planted to grain crops, flax or rapeseed. **Rotational crops:** Fields previously treated with Tordon 202C may be seeded to rapeseed (including canola), mustard, flax, wheat, oats, barley or summerfallow. **Succeeding crops:** Certain desirable broadleaf crops can be damaged by small amounts of Tordon 202C in the soil. Alfalfa and sunflower should be planted at least 3 years after treatment. Beans, lentils, peas and potatoes after 5 years. **Handling Treated Soils:** Treated soil should not be moved to other areas, nor used to grow susceptible broad-leaf plants unless an adequately sensitive bioassay or chemical test shows that no detectable picloram is present.

14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (2,460). May cause eye irritation. Non-toxic to fish and bees. There is no dioxin in the 2,4-D of this formulation.

15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) to avoid exposure. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical attention.

16. STORAGE: Heated storage. If freezing occurs, warm and mix thoroughly before using.

# TREFLAN (trifluralin)

Elanco

## (Cereals)

1. FORMULATIONS: Treflan: Emulsifiable concentrate 545 g/L, 8.5 L container.
2. REGISTERED MIXES: With Avadex BW, Liquid Fertilizer, and Avadex BW + Liquid Fertilizer.  
Mix Restrictions: Add Treflan or Treflan + Avadex directly into the liquid fertilizer, mix thoroughly and apply as soon as possible. Agitate until application is complete.
3. CROPS: Wheat (spring and durum), barley.  
Underseeding: Not recommended.
4. WEEDS CONTROLLED: Green foxtail.
5. WEEDS SUPPRESSED: None
6. WHEN USED: Apply alone or as a tank mix with Avadex BW in the spring after seeding and prior to emergence of wheat or barley.
7. HOW TO APPLY:  
**With:** Ground Equipment  
**Rate:** 445 mL/ac on light to medium textured soil. 610 mL/ac on heavy textured soil.  
**Water Volume:** 40 L/ac  
**Incorporation:** Incorporate 2-4 cm with two cross harrowings with tine or diamond harrows operated at a speed of at least 9 km/h. Both incorporations should be done within 24 hours of application.  
**Pressure:** 275 kPa
8. SPRAYING TIPS: Apply only on fields that are trash free or summerfallow fields. Crop must be seeded 5-8 cm deep in a well tilled seedbed to prevent contact between the chemical and the seed.
9. HOW IT WORKS: Acts on both the root and shoot tips as they emerge. Prevents cell division and affected plants die before emergence. If the shoot portion of the plant escapes to the soil surface, lateral or secondary root growth is inhibited causing a slow death since the plant is unable to gather moisture or nutrients.
10. EXPECTED RESULTS: **Green Foxtail:** Seeds germinating in the treated layer die before reaching the soil surface because root and shoot growth are inhibited. Seeds germinating below the treated layer will produce plants that will emerge. The secondary root system of plants that form within the treated layer is completely inhibited by trifluralin present in that area. The affected plant dies slowly as crop competition and temperature stress over-tax the rootless plant's ability to take up moisture. **Crop:** injury is minimized when seeded to a depth of 5-8 cm.
11. EFFECTS OF RAINFALL: No effect once incorporated into the soil.
12. MOVEMENT IN SOIL: None.
13. GRAZING AND CROPPING RESTRICTIONS: None.
14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (10,000). In clean water, fish are very sensitive to trifluralin; but in runoff and muddy water, trifluralin binds to the suspended soil particles and large amounts can be tolerated by fish. Non-toxic to bees.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - do NOT induce vomiting. Get medical attention.
16. STORAGE: Do not store below 5°C. If stored below 5°C, bring the contents to 15°C for 24 hours and shake well before using.

**SPECIAL USE: Treflan QR5 on Barley ONLY.**

- (a) Weeds Controlled/Spraying Tips: See QR5 under Treflan (oilseed).
- (b) When Used: Fall application **only**. September 1 to freeze up.
- (c) How to Apply: See QR5 under Treflan (oilseed).
- (d) Rate: On sandy textured brown and dark brown soil (2-4% O.M.): 6.9 kg/ac. On medium or heavy textured brown and dark brown soils (2-4% O.M.): 8.9 kg/ac. On light black soils (4-6% O.M.): 8.9 kg/ac. On medium or heavy textured black soils (4-6% O.M.): 11.3 kg/ac.
- (e) Warning: Do not apply on soils containing less than 2% organic matter or on deep black soil containing more than 6% organic matter. Application to severely eroded knolls may result in reduced crop stand. Do not apply on land treated with Treflan since June 1 of the previous year. Using press or hoe drill, seed 5 cm deep into a moist, warm seedbed. Avoid seeding into very cold soil.

# TREFLAN (trifluralin)

Elanco

## (Oilseeds, Special Crops)

1. FORMULATIONS: Treflan: Emulsifiable concentrate 545 g/L (Treflan 545EC), 8.5 L. 5% Granular (Treflan QR5), 25 kg bags.
2. REGISTERED MIXES: Treflan + Liquid Nitrogen Fertilizer (28-0-0). (Pour directly into liquid fertilizer, mix thoroughly and apply as soon as possible with constant agitation.)  
Treflan 545 EC + Sencor 500 F or 75 DF - Fababeans, Triazine tolerant canola (see Spectrum).
3. CROPS:

canola, triazine tolerant	beans, lima	lentils* (8.7)	rapeseed (8.8)
crambe	fababeans (8.6)	mustard (9.0)	soybeans (8.8)
beans, dry (8.0)	flax* (7.7)	peas (8.7)	sunflowers (9.0)

\* Fall application only.  
Underseeding: Not recommended.
4. WEEDS CONTROLLED:

annual bluegrass	chickweed (7.1)	knotweed	purslane
barnyard grass (8.3)	cow cockle (9.0)	lamb's-quarters (8.0)	thistle, Russian (7.9)
bromegrass	downy brome	Persian darnel	wild oats (7.5)
buckwheat, wild (8.3)	foxtail (green, yellow) (8.1)	pigweed (8.2)	
5. WEEDS SUPPRESSED: None.
6. WHEN USED: **Spring application:** cultivate to destroy existing weeds and apply pre-plant. **Fall application:** September 1st to freeze-up. **Fall incorporation is discouraged where soil drifting is a problem.** **Summer application:** On summerfallow between June 1st to September 1st. **Special Instructions for Flax, Lentils:** Not recommended for spring application. Both incorporations of Treflan or QR5 must be done in the fall. Shallowly till and pack the soil in the spring to ensure a firm seedbed and an accurate depth for seeding.
7. HOW TO APPLY:

**With:** Ground equipment only.

**Rate:**  
**Spring Application** - (a) Treflan 610 mL/ac on sandy soils with less than 6% organic matter. (b) Treflan 810 mL/ac on all medium and heavy textured soils up to 15% organic matter and on sandy soils with greater than 6 but less than 15% organic matter. (c) Treflan 1050 mL/ac on medium and heavy textured soils with 6-15% organic matter and high wild oat pressure.  
**Fall Application** - (a) 810 mL/ac 545 EC, QR5: 8.9 kg/ac on sandy soils less than 6% organic matter. (b) 1050 mL/ac 545 EC, QR5 11.3 kg/ac on all medium or heavy textured soils up to 15% organic matter and for sandy soil with greater than 6% but less than 15% organic matter. (c) 1.2 L/ac 545 EC, QR5 13.7 kg/ac on medium and heavy textured soils with 6-15% organic matter and high wild oat pressure.  
**Summer Application** - Between June 1st and September 1st. Treflan - 1.2 L/ac. Treflan QR5 - 13.7 kg/ac.  
**Triazine Tolerant Canola** - See Spectrum or Sencor for application rates as a tank mix with Sencor. Treflan 545 EC and QR5 alone may be applied in the summer, fall and spring for Triazine Tolerant Canola. Sencor or Bladex may then be applied after crop emergence to control several additional weeds.  
**Water Volume:** 40 L/ac  
**Incorporation:** First incorporation at a right angle must be done within 24 hours of application. A tandem disc, discer or field (vibra shank) cultivator are recommended for incorporating to 8-10 cm. To get the best mixing action, operate the disc implement at 6-10 km/h and the cultivator at 10-13 km/h.  
**Pressure:** 275 kPa
8. SPRAYING TIPS:
  - (a) Do not apply Treflan 545EC to soils with more than 20-25% straw cover or on standing weeds. On stubble, chop and thoroughly mix residues into the soil prior to addition of Treflan EC.
  - (b) Treflan QR5 can be used when trash is heavier provided it does not interfere with the distribution of the granule and does not limit incorporation
  - (c) Delay second incorporation of QR5 for 3 days. This allows time for greater release of QR5 into the soil and assures a more uniform distribution.
  - (d) A tandem disc gives the best mixing action on stubble conditions
  - (e) Do not use a field cultivator to incorporate Treflan when soil is crusted, lumpy or too wet for good mixing.
  - (f) Fall application should be followed with 2 incorporations at right angles, before freeze-up.
  - (g) Fall or summer application should be followed by a light spring tillage to a 5-8 cm deep before seeding.
  - (h) Do not apply on soils that are wet, in poor tilth, or contain 15% or more organic matter.
  - (i) To avoid concentrating wild oat seeds below the treated layer, do not plow land prior to Treflan application.
  - (j) Overapplication caused by overlapping or improper calibration or non-uniform application may reduce the stand of crop grown in rotation.
9. HOW IT WORKS: Treflan kills seedlings as they germinate. Inhibits cell division in the actively growing points of the root and shoot.
10. EXPECTED RESULTS: **Weeds:** Most weeds die before emerging. Weeds will exhibit swelling in the coleoptile region,

Stubby, thick primary root development and lack of secondary roots, which leads to death due to inadequate moisture obtaining ability. **Crop:** seed flax into a well packed warm moist seedbed. Do not seed deeper than 4 cm.

11. EFFECTS OF RAINFALL: No effect once Treflan is incorporated into the soil.

12. MOVEMENT IN SOIL: None.

13. GRAZING AND CROPPING RESTRICTIONS: None. **Crop Use After Hail:** No restrictions **Succeeding Crops:** Normally, Treflan carry over will not harm crops grown in rotation. As a precaution, oats, sugar beets and small seeded annual grasses should not be grown in rotation following a trifluralin treated crop. Drought conditions in the year of treatment may result in higher levels of trifluralin carry-over into the next year. To avoid wheat injury, seed less than 7 cm deep into a warm moist seedbed.

14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (10,000). In clean water, fish are very sensitive to trifluralin, but in run off or muddy water, it binds to soil particles and large amounts can be tolerated by fish. Non-toxic to bees.

15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - do NOT induce vomiting. Get medical attention.

16. STORAGE: Do not store below 5°C. If stored below 5°C, bring the contents to 15°C for 24 hours and shake well before using. Do not store near heat, spark or open flame.

**Triflurex (trifluralin)**  
**Makhteshim – Agan**

**(Cereals)**

1. FORMULATIONS: Triflurex: Emulsifiable concentrate 400 g/L, 22.7 L
2. REGISTERED MIXES: With Avadex BW, Liquid Fertilizer, and Avadex BW + Liquid Fertilizer.  
**Mix Restrictions:** Add Triflurex or Triflurex + Avadex directly into the liquid fertilizer, mix thoroughly and apply as soon as possible. Agitate until application is complete.
3. CROPS: Wheat (spring and durum), barley.  
Underseeding: Not recommended.
4. WEEDS CONTROLLED: Green foxtail.
5. WEEDS SUPPRESSED: None
6. WHEN USED: Apply alone or as a tank mix with Avadex BW in the spring after seeding and prior to emergence of wheat or barley.
7. HOW TO APPLY:  
**With:** Ground Equipment  
**Rate:** Triflurex at 565 mL/ac on light to medium textured soil. Triflurex at 850 mL/ac on heavy textured soil.  
**Water Volume:** 40 L/ac  
**Incorporation:** Incorporate 2-4 cm with 2 cross harrowings with tine or diamond harrows operated at a speed of at least 9 km/h. Both incorporations should be done within 24 hours of application.  
**Pressure:** 275 kPa
8. SPRAYING TIPS: Apply only on fields that are trash free or summerfallow fields. Crop must be seeded 5-8 cm deep in a well tilled seedbed to prevent contact between the chemical and the seed.
9. HOW IT WORKS: Acts on both the root and shoot\* tips as they emerge. Prevents cell division and affected plants die before emergence. If the shoot portion of the plant escapes to the soil surface, lateral or secondary root growth is inhibited causing a slow death since the plant is unable to gather moisture or nutrients.
10. EXPECTED RESULTS: **Green Foxtail:** Seeds that germinate below the treated layer will produce plants that will emerge. The secondary root system of plants that form within the treated layer is completely inhibited by trifluralin present in that area. The affected plant dies slowly as crop competition and temperature stress over-tax the rootless plant's ability to take up moisture. **Crop:** injury is minimized when seeded to a depth of 5-8 cm.
11. EFFECTS OF RAINFALL: No effect once incorporated into the soil.
12. MOVEMENT IN SOIL: None.
13. GRAZING AND CROPPING RESTRICTIONS: None.
14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (10,000). In clean water, fish are very sensitive to trifluralin; but in runoff and muddy water, trifluralin binds to the suspended soil particles and large amounts can be tolerated by fish. Non-toxic to bees.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN – use standard first aid measures (see page 3). IF SWALLOWED – do NOT induce vomiting. Get medical attention.
16. STORAGE: Do not store below 5°C. If stored below 5°C, bring the contents to 15°C for 24 hours and shake well before using. Do not store near heat, spark or open flame.

Triflurex (trifluralin)  
Makhteshim – Agan

(Oilseeds, Special Crops, Vegetable Crops)

1. FORMULATIONS: Triflurex: Emulsifiable concentrate 400 g/L, 22.7 L
2. REGISTERED MIXES: Triflurex + Liquid Nitrogen Fertilizer (28-0-0). (Pour directly into liquid fertilizer, mix thoroughly and apply as soon as possible with constant agitation.)
3. CROPS:

beans, dry (8.0)	cabbage	fababean (8.6)	peppers
beans, lima, snap (8.8)	carrots (8.4)	flax (7.7)	rapeseed (8.8)
beans, soy (8.9)	canola, triazine tolerant	lentils* (8.7)	sunflowers (9.0)
broccoli, transplants (9.0)	cauliflower	mustard (9.0)	tomatoes, transplants (9.0)
brussel sprouts, transplants (9.0)	crambe	peas (8.7)	turnips

\* Fall application only.  
Underseeding: Not recommended.
4. WEEDS CONTROLLED:

barnyard grass (8.3)	buckwheat, wild (8.3)	foxtail (green, yellow) (8.1)	pigweed (8.2)
bluegrass, annual	chickweed (7.1)	knotweed	purslane
bromegrass	cow cockle (9.0)	lamb's-quarters (8.0)	thistle, Russian (7.9)
brome, downy	darnel, Persian	oats, wild (7.5)	
5. WEEDS SUPPRESSED: None.
6. WHEN USED: **Spring application:** cultivate to destroy existing weeds and apply pre-plant. **Fall application:** September 1st to freeze-up. **Fall incorporation is discouraged where soil drifting is a problem.** **Summer application:** On summerfallow between June 1st to September 1st. **Special Instructions for Lentils:** Not recommended for spring application. Both incorporations of Triflurex must be done in the fall. Shallowly till and pack the soil in the spring to ensure a firm seedbed and an accurate depth for seeding.
7. HOW TO APPLY:

**With:** Ground equipment

**Rate:** **Spring Application:** (a) 810 mL/ac on sandy soils less than 6% organic matter. (b) 1.1 L/ac on medium or heavy textured soils, 6-15% organic matter, and low to medium wild oat infestations. **Fall Application:** (a) 1.1 L/ac on sandy soils less than 6% organic matter. (b) 1.4 L/ac on medium or heavy textured soils, 6-15% organic matter, and low to medium wild oat infestations. **Summer Application:** June 1-Sept. 1. 1.7 L/ac on all soils.

**Water Volume:** 40 L/ac

**Incorporation:** First incorporation at a right angle must be done within 24 hours of application. A tandem disc, discer or field (vibra shank) cultivator are recommended for incorporating to 8-10 cm. To get the best mixing action, operate the disc implement at 6-10 km/h and the cultivator at 10-13 km/h.

**Pressure:** 275 kPa
8. SPRAYING TIPS: (a) Use on soils with less than 20-25% straw cover. On stubble, chop and thoroughly mix residues and weed growth into the soil before application.  
(b) A tandem disc mixes best on stubble or poor condition soils (crusted, lumpy or wet). Fall application should be followed with 2 incorporations at right angles, before freeze-up. This or a summer application should be preceded by a light spring tillage to a 5-8 cm depth before seeding.  
(c) Do not apply on soils that are wet, in poor tilth, or contain 15% or more organic matter.  
(d) To avoid concentrating wild oat seeds below the treated layer, do not plow land prior to Triflurex application.  
(e) Do not apply with air seeder as it gives non-uniform seeding depth and patchy germination.
9. HOW IT WORKS: Kills seedlings as they germinate. Inhibits cell division in actively growing points of the root and shoot.
10. EXPECTED RESULTS: **Weeds:** Most weeds die before emerging. Weeds will exhibit swelling in coleoptile region, stubby, thick primary root development and lack of secondary roots, which leads to death due to inadequate moisture obtaining ability. **Crop:** Seed flax into a well packed warm moist seedbed. Do not seed deeper than 4 cm.
11. EFFECTS OF RAINFALL: No effect once Triflurex is incorporated into the soil.
12. MOVEMENT IN SOIL: None.
13. GRAZING AND CROPPING RESTRICTIONS: None. **Crop Use After Hail:** No restrictions **Succeeding Crops:** Normally, carry over will not harm crops grown in rotation. As a precaution, oats, sugar beets and small seeded annual grasses should not be grown in rotation following a trifluralin treated crop. Drought conditions in year of treatment may result in higher levels of carry-over into the next year. To avoid wheat injury, seed less than 7 cm deep into a warm moist seedbed.
14. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (10,000). In clean water, fish are very sensitive, but in run off or muddy water, it binds to soil particles and large amounts can be tolerated by fish. Non-toxic to bees.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN – use standard first aid measures (see page 3). IF SWALLOWED – do NOT induce vomiting. Get medical attention.
16. STORAGE: Do not store below 5°C. If stored below 5°C, bring the contents to 15°C for 24 hours and shake well before using. Do not store near heat, spark or open flame.

**TROPOTOX (MCPB)**  
May and Baker



CAUTION POISON

1. FORMULATIONS: Liquid - 400 g/L - 8 L.
2. REGISTERED MIXES: None
3. CROPS: Field peas (8.4)
4. WEEDS CONTROLLED:

buttercup, tall	lamb's-quarters(8.5)	plantain	smartweed, annual
dock, curled	mustard (ball, wild, wormseed)(7.5)	purslane	sow-thistle, annual
flixweed	pigweed, redroot (7.9)	ragweed	stinkweed (6.7)
hemp-nettle			
5. WEEDS SUPPRESSED: Canada thistle (5.4), field bindweed (3.2), shepherd's-purse (4.0).
6. WHEN USED: Peas - 3-6 expanded leaves.
7. HOW TO APPLY:

**With:** Ground equipment.  
**Rate:** 1.4-1.7 L/ac  
**Water Volume:** 60-80 L/ac  
**Pressure:** 275 kPa
8. SPRAYING TIPS: Apply in warm weather when weeds are actively growing. Provides only top growth control of Canada thistle and field bindweed.
9. HOW IT WORKS: Systemic, absorbed by leaves and stem. Selectivity is based on ability of some plants to convert MCPB to MCPA.
10. EXPECTED RESULTS: **Weeds:** begin to twist within 2-10 days, turn brown and die within 2-3 weeks. **Poor results may be expected if:** water volume is incorrect or weeds too mature. **Crops:** If peas are beyond proper stage or are under drought or disease stress, damage may occur.
11. EFFECT OF RAINFALL: Rainfall before spray has dried on leaves will decrease activity.
12. MOVEMENT IN SOIL: Not applicable.
13. GRAZING AND CROPPING RESTRICTIONS: None listed.
14. TOXICITY: Slightly high acute oral mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (500). Non-toxic to bees.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical attention.
16. STORAGE: Heated storage required.

**TROPOTOX PLUS (MCPB + MCPA)**  
May and Baker



CAUTION POISON

1. FORMULATIONS: Water soluble solution 375 g/L MCPB + 25 g/L MCPA; 8 L.
2. REGISTERED MIXES: None
3. CROPS: Spring wheat (8.9), barley (8.8), oats, fall rye, seedling clover (wild white, white Dutch, Ladino, alsike (7.2) and red), field peas (8.1), pasture, field corn.  
Underseeding: For clover, can be used on a cereal companion crop.
4. WEEDS CONTROLLED:

bindweed, field (3.2)	knotweed	purslane	sow-thistle, annual (5.4)
buttercup, tall	lamb's-quarter (8.2)	ragweed	stinkweed (7.5)
dock, curled	mustard (ball, wild, wormseed)(7.9)	shepherd's-purse (5.0)	thistle (bull, Canada (6.1))
hemp-nettle (5.9)	pigweed, redroot (8.3)	smartweeds, annual (5.1)	
5. WEEDS SUPPRESSED: Not applicable.
6. WHEN USED: *Cereals*: 2 leaf to flag leaf stage. *Clover*: 1-4 true leaf stage. *Peas*: 3-6 expanded leaves. *Pasture*: after grazing or cutting. *Corn*: 45 cm high but before tasseling begins, with drop nozzles. *Weeds*: seedling stage.
7. HOW TO APPLY:  
**With:** Ground equipment  
**Rate:** 1.1-1.7 L/ac depending on weeds to be controlled.  
**Water Volume:** 60-80 L/ac  
**Pressure:** 275 kPa
8. SPRAYING TIPS: Spray in warm weather when plants are actively growing.
9. HOW IT WORKS: A systemic herbicide absorbed by leaves and stems, translocated to actively growing regions, disrupts cell division, ceases cell growth and interferes with respiration and food reserves. Selectivity based on ability of plant to efficiently convert MCPB to MCPA.
10. EXPECTED RESULTS: *Broad-leaved weeds*: Should be dead within 2-3 weeks of treatment. *Poor results may be expected if*: water volume is incorrect or weeds are too mature.
11. EFFECTS OF RAINFALL: Rainfall before the foliage has dried from the spraying may decrease activity.
12. MOVEMENT IN SOIL: Not applicable.
13. GRAZING AND CROPPING RESTRICTIONS: None listed.
14. TOXICITY: Slightly high acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (500). Non-toxic to bees.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) to avoid exposure. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical attention.
16. STORAGE: Store in heated area.

**VELPAR (hexazinone)**

DuPont

1. FORMULATIONS: Soluble powder - 90% hexazinone - 25 kg pack. Liquid - 24% hexazinone - 3.78 L jugs.
2. REGISTERED MIXES: None.
3. CROPS: Non-crop land only. An industrial herbicide for total vegetation control. Woodland plantations.
4. WEEDS CONTROLLED: Annual and perennial grasses, broad-leaved weeds and some woody species.
5. WEEDS SUPPRESSED: None.
6. WHEN USED: Apply just before or when weeds are actively growing. Do not apply to frozen ground.
7. HOW TO APPLY:  
**With:** Fixed boom sprayer, handgun, back pack sprayers, a watering can for smaller areas, or a spot gun.  
**Rate:** For contact top growth or short term (3 months) control - apply 1.1-1.8 kg/ac as a foliar spray. For more than 1 season control, apply 1.8-3.6 kg/ac as a foliar spray. The higher rates of application should be used on fine textured soil (clay or clay loam) or on soils containing more than 5% organic matter.  
**Water Volume:** When applying with a handgun use a minimum of 650 L/ac of spray solution.
8. SPRAYING TIPS: See "Soil Sterilants" page 4.
9. HOW IT WORKS: A systemic herbicide readily absorbed through the roots and foliage and translocated upwards. Inhibits photosynthesis.
10. EXPECTED RESULTS: Plants become chlorotic soon after treatment and then die. Rainfall will increase efficacy. **Poor results may be expected if:** there is inadequate application rate, weed growth too mature, insufficient rainfall or application on areas subject to severe soil erosion.
11. EFFECTS OF RAINFALL: Rainfall less than 4 hours after application may affect the contact activity.
12. MOVEMENT IN SOIL: Velpar moves downward in the soil to the root zone of woody species.
13. GRAZING AND CROPPING RESTRICTIONS: None. **Succeeding Crops:** Velpar is a non-selective residual herbicide. Only used on non-crop land.
14. TOXICITY: Low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (1,690). May cause some eye irritation. Slightly toxic to fish.
15. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2). IF IN EYES or ON SKIN - use standard first aid measures (see page 3).
16. STORAGE: Store in a cool, dry place.

**PLANT GROWTH REGULATOR**  
**CERONE (ethephon)**  
**Union Carbide**

1. FORMULATIONS: Liquid solution, 480 g/L; 5 L.
2. REGISTERED MIXES: None. **Mixing instructions:** To 1/2 required amount of water add Cerone, start agitation, then add the rest of water. Maintain gentle agitation at all times.
3. CROPS: Barley - Bedford, Bonanza, Galt and Johnston varieties **only**.
4. WHEN USED: From early flag leaf emergence to swollen-boot stage. Do not apply after the awns have emerged.
5. HOW TO APPLY:  
**With:** Ground or aircraft. Do not use control droplet applicators, Spra-Coups or floaters.  
**Rate:** 200-340 mL/ac  
**Water Volume:** Aircraft - minimum of 20 L/ac; Ground - 40-120 L/ac.  
**Pressure:** Ground - 275 kPa  
**Nozzles:** Do not apply with flood jet nozzles.
6. SPRAYING TIPS: Use the higher rates on crops that are heavily fertilized, have ample moisture and are prone to lodging. Use the lower rate unless lodging conditions are expected to be severe. DO NOT APPLY TO CROPS WHICH ARE UNDER STRESS as severe yield reductions may result. To prevent permanent staining of painted surface, wash all equipment at end of each spray operation.
7. HOW IT WORKS: Uptake primarily through the leaves and stem. Very little translocation throughout the plant.
8. EXPECTED RESULTS: Cerone acts by releasing ethylene in the plant tissues which reduces cell elongation and plant height, usually by 2-15 cm. Cerone applications also strengthen the straw. An occasional delay in maturity may occur. This is normally not greater than 5 days and is generally less than that caused by lodging.
9. EFFECTS OF RAINFALL: Rainfall within 5 hours will decrease activity.
10. MOVEMENT IN SOIL: Not applicable.
11. GRAZING AND CROPPING RESTRICTIONS: **Drift:** Avoid drift onto nearby crops as modifications in growth may result.  
**Grazing Restrictions:** Do not graze treated green crop. Treated straw may be fed to livestock. Do not apply within 35 days of harvest. **Succeeding Crops:** No restriction.
12. TOXICITY: Very low acute mammalian toxicity; oral LD<sub>50</sub> rats (mg/kg) = (4,229). Cerone is highly acidic and will cause skin irritation. Over exposure may cause nausea. Inhalation may cause irritation of mucous membranes. Eye contact may cause eye damage.
13. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) plus rubber gloves, goggles, and respirator when handling Cerone. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). Get medical attention for eyes. IF SWALLOWED - do NOT induce vomiting; get immediate medical attention. Treatment is symptomatic.
14. STORAGE: Do not freeze.



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### **CHEMICAL INSECT CONTROL IN ALBERTA**

The degree of infestation and the severity of insect damage vary drastically from area to area and season to season. Some pests, such as grasshoppers and bertha armyworms, require control during periods of abundance which may last from one to several years. Other pests are perennial; sugar beet root maggot, for example, is controlled by the application of a granular insecticide at planting.

To insure proper use of insecticides identify the pest, learn its biology, check your fields and do not panic when you see an insect in your crop. Keep in touch with extension personnel to obtain information on pending pest problems and keep in mind the previous years' problems so you are prepared for changes in insect population levels.

#### **Chemical Control**

Attention to the following points should lead to more effective control. Insecticides will kill the pest insect if applied properly at a stage when the pest is susceptible. An application that is made too early or too late in the life cycle may not provide adequate control and would be wasteful. Follow label instructions for proper application and learn the biology of the pest. Base control decisions on the amount of foliage, weather conditions, age and size of the insect and dosage required. Most insecticides have limited residual control properties when applied to foliage; if insects are moving into crops or emerging over an extended period, several applications in the same season may be necessary.

#### **Safety**

In general, insecticides are more toxic to humans, wildlife, fish, bees and other non-target organisms than herbicides. Follow label directions for safety precautions associated with application of each insecticide. Refer to pages 2-8 for general information on pesticide toxicity, exposure, safety precautions, protective equipment, symptoms, first aid, poison control centres, and disposal. Specific information on safety is included with each insecticide.

#### **Bee Safety**

Only bees and other pollinators are susceptible to most insecticides. If applications are made to weeds or crops in bloom, severe pollinator mortality may occur. To reduce this risk, apply insecticides in late evening (most preferred) or early morning when bees are not flying. Advise beekeepers in the area to be sprayed at least 48 hours before application so they can protect their bees. Never allow insecticide spray to drift directly onto an apiary site. Do not apply insecticides to water bodies which may be used by bees.

#### **Livestock and Residues**

The number of days between application of an insecticide and harvesting, feeding to livestock, or grazing is given on the label. These restrictions must be followed to prevent illegal residues and eliminate hazards to consumers. Follow label instructions.

#### **Use Manual**

This manual includes only the major insecticides registered for use in Alberta. Not all insects controlled are listed for each pesticide; see the labels for complete listings.

**AMBUSH, POUNCE (permethrin)**  
**Chipman/Chemagro**



**WARNING POISON**

1. **FORMULATIONS:** Emulsifiable concentrates - Ambush (500 g permethrin/L). Pounce (384 g permethrin/L). Ambush: 1% granular and 25% wettable powder.

2. **HOW IT WORKS:** Works by contact and as a stomach poison on a wide range of pests. Good residual activity. No systemic or fumigant activity.

3. **HOW TO APPLY:**

**With:** Ground equipment only.

**Rate:**

**Crop**

barley, corn, oats, rye, wheat, canola, mustard, sunflower, sugar beets, sweet corn(1)

**Insect**

Cutworms (army, pale western, red-backed)

**Formulation**

Ambush 500 EC

**Qty/ac**

57-120 mL

sweet corn(1)

Corn earworm, European corn borer

Ambush 500 EC

81-111 mL

Ambush 1%

4 kg

Pounce

110-150 mL

potato(1)

Colorado potato beetle, potato flea beetle, potato leafhopper, tarnished plant bug

Ambush 500 EC

57-81 mL

Pounce

75-110 mL

**NOTE:** Pre-harvest interval (days) given in brackets after crop.

**Water Volume:** Corn applications, use: with Ambush 130-180 L/ac; with Pounce 140-180 L/ac

Potato application, use sufficient water to obtain thorough coverage of foliage.

4. **APPLICATION TIPS:** Use the higher rate for heavy infestations (anticipated or actual), or when adult insects are present, or when foliage is dense, or (for cutworms) when soil is dry.

Corn - spray no later than when first feeding damage is seen on foliage. For control of corn earworm, direct spray to ensure coverage of ears and silk. For European corn borer control, consult with provincial agriculturalist for proper timing of spray.

5. **GRAZING RESTRICTIONS:** Do not feed any crop treated with permethrin to livestock.

6. **TOXICITY:** Acute oral LD<sub>50</sub> rats (mg/kg) = (430-4,000). Severe eye irritant. Toxic to bees.

7. **PRECAUTIONS, FIRST AID:** Wear protective equipment to avoid contact with skin and eyes. Do NOT inhale spray mist. Do not spray when bees are foraging. Keep product away from fire, open flame, electric light bulbs and other sources of heat.

**First Aid:** IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - Do NOT induce vomiting or administer liquids; product contains petroleum distillates. Get medical attention immediately.

8. **DECONTAMINATION AND DISPOSAL:** Rinse empty bottle 3 times with clean water, each time disposing of rinse in the spray tank. Break rinsed bottle and cap and dispose of in garbage.

## COUNTER (terbufos)

Cyanamid



FORMULATIONS: Granules - Counter 5-G (5% terbufos), Counter 15-G (15% terbufos)

REGISTERED MIXES: 5G may be mixed with fungicide treated seed.

HOW IT WORKS: Terbufos is a systemic, organophosphorus insecticide with effective initial and residual activity.

## HOW TO APPLY:

With: Ground equipment.

## Rate:

Crop	Insect	Formulation	kg/ac
Canola, mustard	Flea beetle	5-G	2.2-4.5
Sugar beet	Sugar beet root maggot, wireworm	15-G	45 g / 100 m row (minimum row spacing of 50 cm)

**Incorporation:** Canola and mustard - carefully blend seed and granules together using a mechanical mixer or stirring with a stick in the drill box. Sugar beets - apply in furrow, 5-8 cm behind the seed drop zone after some soil has covered the seed.

**APPLICATION TIPS:** **NOTE:** If extreme infestations are anticipated use the higher rate. Apply at planting time only. Do not place 15-G granules in direct contact with seed. When a seed treatment is also used - mix the seed treatment with seed, then mix granules with treated seed.

GRAZING RESTRICTIONS: Sugar beet tops and beet pulp may be fed to livestock after harvest.

TOXICITY: Acute oral LD<sub>50</sub> rats (mg/kg) = (1.6).

**PRECAUTIONS, FIRST AID:** Rapidly absorbed through skin. Repeated inhalation or skin contact may, without symptoms, progressively increase susceptibility to poisoning. While transferring from package to equipment, wear a clean cap and gloves (rubber or cotton). If cotton gloves are used, they must be laundered or discarded after each day's use. Clothes and rubber gloves should be washed with soap and water after each use. Do not wear the same gloves for other work. Wash thoroughly with soap and water before eating, drinking or smoking. Bathe at the end of the work day, and change outer clothing.

**DO NOT BREATHE DUST** - While emptying bags into equipment, pour downwind and allow as little free fall as possible. Do not pour at face level and do not allow dust to reach the breathing zone. Sweep up and bury spillage whether it occurs indoors or in the field. Once a bag has been opened, use it completely or bury the remainder. Make sure that the hoppers of equipment are emptied while still in the field. Cover granules that may be exposed on the ends of the treated rows, turns and field loading areas. Keep all unprotected persons out of the operating areas. **Symptoms of poisoning:** weakness, headache, tightness of chest, blurred vision, non-reactive pinpoint pupils, salivation, sweating, nausea, vomiting, diarrhea or abdominal cramps.

**First aid:** CALL A PHYSICIAN AT ONCE IN ALL CASES OF SUSPECTED POISONING. IN EMERGENCY endangering life or property, call collect, day or night, 1-416-356-8310. **ATROPINE IS AN ANTIDOTE.** Consult your physician about obtaining a supply of 0.65 milligram tablets for emergency use. If symptoms include blurred vision, stomach cramps or tightness in chest, do not wait for a physician but take 2 tablets at once. Do not take atropine unless symptoms of poisoning have occurred. Anyone who has been sick enough to have taken atropine must be seen by a physician as soon as possible.

**IF INHALED** - remove to fresh air. If not breathing give artificial respiration, preferably mouth-to-mouth. If breathing is difficult, give oxygen. **IF IN EYES or ON SKIN** - use standard first aid measures (see page 3). Get medical attention for eyes. **IF SWALLOWED** - induce vomiting (see page 3). Get medical attention.

**DECONTAMINATION AND DISPOSAL:** **Decontamination Solution:** Into 10 L of water slowly and carefully add in sequence 130 g detergent followed by 525 g caustic soda (lye) and finally 1.2 litres of commercial bleach (sodium hypochlorite). Handle and use the solution with great care. Do not add water to dry lye. If spill occurs on floor areas, use a sweeping compound to clean up. Decontaminate the waste with decontamination solution. Wash floor with decontamination solution and rinse well with clean water. Clean up solution and rinse water with absorbent materials such as sawdust, sweeping compound, rags, etc. Dispose of waste and rinsings by burying in a non-crop, non-graze area away from all water supplies. If spill occurs on the ground collect the material and dispose of it as above. Treat affected area with decontamination solution and cover with clean soil.

**CYGON (dimethoate)**  
Cynamid/Chipman/Peacock Industries



WARNING POISON

1. **FORMULATIONS:** Emulsifiable concentrates - Cygon 480E, Cygon 4-E, Cygon Hopper-Kill and SYS-TEM 480 EC (480 g dimethoate/L). Hopper Stopper Bran Bait 5.2% (see Bait directions).

2. **NUMBER OF APPLICATIONS:** Repeat as necessary.

3. **HOW IT WORKS:** Dimethoate is a broad-spectrum, systemic and contact, organophosphate insecticide and acaricide.

4. **HOW TO APPLY:**

**With:** Ground or air equipment.

**Rate:**

Crop	Insect	mL/ac
barley, oats	grasshoppers,	180-400
rye, wheat	thrips	400
alfalfa, clovers,	aphids, young grasshoppers,	180
pastures, waste areas	leafhoppers, lygus bugs, plant bugs, alfalfa weevil larvae	
	adult (winged) grasshoppers	340-360
sweet clover	sweet clover weevil	340-400
canola	aphids, grasshoppers	340-360
potato (7)	aphids, leafhoppers	225-450

**NOTE:**

(a) Check each specific label to insure the insect is included on that label.

(b) Grasshopper, sweet clover weevil control: when a range of rates is given, use lower rate for young insects, minor infestations or sparse foliage and higher rate for adult insects (winged grasshoppers and beetles), severe infestations or dense foliage.

**Water Volume:** Use 18 L/ac for good coverage. Potatoes - a minimum of 80 L/ac.

**Protective Equipment:** Wear a respirator when exposure to spray cannot be avoided; wear goggles, rubber gloves and coveralls when handling concentrate.

5. **APPLICATION TIPS:** Apply when insects or damage first appears. Not suitable for application in oil.

6. **GRAZING AND CROPPING RESTRICTIONS:** Remove cattle prior to spraying. Do not graze dairy cattle for 48 hours after application. Pre-harvest interval is dependent upon the rate applied. When using 170-220 mL/ac, do not harvest or graze within 2 days. When using 340-360 mL/ac, do not harvest or graze forages within 7 days, on canola and grains within 21 days. When using 360-450 mL/ac, do not harvest or graze within 28 days. Do not harvest potatoes within 7 days.

7. **TOXICITY:** Acute oral LD<sub>50</sub> rats (mg/kg) = (320-380).

8. **PRECAUTIONS, FIRST AID:** Wear protective equipment to avoid contact with skin and eyes. Do not inhale spray mist. Use in adequately ventilated area. Do not use or spill or store near heat or open flame. Do not use when bees are foraging.

**Symptoms of poisoning:** anorexia, nausea, vomiting, pinpoint pupils, excessive salivation, muscle twitching, convulsions or coma.

**First Aid:** IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical attention in all cases.

9. **STORAGE:** Store between 5°C and 30°C, away from feed and food.

10. **DECONTAMINATION AND DISPOSAL:** If accidental spillage should occur, scrub contaminated area immediately with a strong laundry soap solution or use household lye - detergents are not satisfactory for this purpose. Repeated scrubbings are necessary on plain wood surfaces. **Disposal:** Drain container completely into spray tank. Then rinse container at least 3 times, filling at least 1/4 full with water each time and draining into spray tank after each rinse. Crush or break empty container and bury it with at least 0.5 m of cover and away from water supplies.

#### **HOPPER STOPPER BRAN BAIT**

**Application:** Bait is applied dry and broadcasted evenly to control grasshoppers. Apply no more than once a week for heavy infestations and no more than once every 2 weeks for moderate to low infestations. Do not contaminate bodies of water, food or feed. **Rate:** 0.8-1.2 kg/ac. Non-toxic to pollinators if applied as directed. **Beef Cattle** do not have to be removed during treatment. **Dairy Cattle:** do not graze or harvest forage for 48 hours. **Grain Crops:** do not harvest for 21 days after treatment. **Disposal:** Do NOT burn empty bags.

DECIS (deltamethrin)  
Hoechst



1. FORMULATIONS: Emulsifiable concentrate - Decis 5 EC (50 g/L).
2. HOW IT WORKS: Deltamethrin is a non-systemic, synthetic pyrethroid which works by contact and ingestion.
3. NUMBER OF APPLICATIONS: Maximum of 3 applications per year. Only 1 application to a field by air per year.
4. HOW TO APPLY:

With: Ground equipment, (G) or Air (A).

Rates:

Crop	Insect	mL/ac
Alfalfa (seed production only)(G)	Alfalfa weevil	100
	Lygus bugs	80-100
Canola, mustard (both 14)(G or A)	Flea beetles (Bertha armyworm, clover cutworm)	40-60
Potato (23)(G or A)	Colorado potato beetle, tarnished plant bug, potato flea beetle	40-60
Wheat, barley, flax, oats (all 40)(G or A)	Cutworms Grasshoppers	80 40-60

NOTE:

(a) Pre-harvest interval (days) given in brackets at crop.

(b) Use higher rate for severe infestation, on dense foliage, or when adult insects are present.

**Water Volume:** Ground application: alfalfa - 40-120 L/ac; canola and mustard - 40 L/ac; potatoes - 80-200 L/ac; cereals and flax - 40-80 L/ac. Aerial application: 4.4-8.8 L/ac.

**Pressure:** Ground application: 275 kPa. Aerial application: no less than 200 kPa.

5. APPLICATION TIPS: Do not spray under a strong temperature inversion, or when temperature exceeds 25°C. Aerial application: leave 100 m border between edge of treated fields and environmentally sensitive areas. Do not use raindrop nozzles. Do not mix product with any other chemicals, additives or fertilizers. With severe flea beetle and grasshopper infestations, spray fence rows and a 15 m strip into adjacent summerfallow and cropped fields. Apply to young (non-flying) grasshoppers for best results. Apply when insects or damage first appears.
6. GRAZING RESTRICTIONS: Do not graze treated fields. Do not feed treated crops to livestock, including crops damaged by hail.
7. TOXICITY: Acute oral LD<sub>50</sub> rats (mg/kg) = (395). Severe eye and skin irritant.
8. PRECAUTIONS, FIRST AID: Wear protective gear to avoid contact with skin and eyes. Do not inhale. Keep away from fire, open flame and other sources of heat. Do not apply when bees are foraging. **Symptoms of poisoning:** neurological dysfunction, such as convulsion with severe poisoning.  
**First Aid:** IF IN EYES or ON SKIN - use standard first aid measures (see page 3). Treat irritated skin area with Nivea cream. IF SWALLOWED - Do NOT induce vomiting or administer liquids. This product contains xylene. Get medical attention.
9. STORAGE: Do not store below freezing. Do not store near feed or food.
10. DECONTAMINATION AND DISPOSAL: Rinse empty containers with clean water at least 3 times, each time adding rinse water to spray tank. Crush rinsed containers and either bury at least 50 cm deep in loamy soil in a non-crop, non-graze area away from all water supplies or deliver to an approved land fill.



1. **FORMULATIONS:** Wettable powder (WP) - Diazinon 50W (50% diazinon).  
Emulsifiable concentrate (EC) - Diazinon 500 (500 g diazinon/L).
2. **REGISTERED MIXES:** When using WP as a seed treatment for corn and sugar beets, mix with a fungicide (75% Captan or 75% Thiram).
3. **HOW IT WORKS:** Diazinon is a non-systemic, organophosphate insecticide which works by contact and ingestion. Diazinon deteriorates rapidly in solution and in containers once opened.
4. **NUMBER OF APPLICATIONS:** Repeat as necessary.
5. **HOW TO APPLY:**  
With: Ground equipment.  
**Rate:**

Crop	Insect	Formulation	Qty/ac
Potato (14)	Aphids, Colorado potato beetle, flea beetles, leafminers, leafhoppers	WP EC	0.5 kg 0.5 L

**NOTE:** Pre-harvest interval (days) given in brackets after crop.
6. **APPLICATION TIPS:** Spray when insects first appear.
7. **TOXICITY:** Acute oral LD<sub>50</sub> rats (mg/kg) = (250). Toxic to bees.
8. **PRECAUTIONS, FIRST-AID:** Wear protective gear to avoid contact with skin or eyes - do not inhale spray mist. Do not apply to crops in bloom. **Symptoms of poisoning:** headaches, giddiness, blurred vision, nervousness, weakness, nausea, cramps, diarrhea, discomfort in the chest, sweating, pinpoint pupils, tearing, salivation, vomiting, uncontrolled muscle twitching, convulsions, or coma. **IF IN EYES or ON SKIN** - use standard first aid measures (see page 3). **IF SWALLOWED** - induce vomiting (see page 3). Get medical attention.
9. **STORAGE:** Do not store or use EC near heat or open flame. Flash point 27°C.
10. **DECONTAMINATION AND DISPOSAL:** **Spills on concrete floors:** surround and cover spill with a granular carrier such as Attaclay, (cat litter). Allow carrier to absorb the liquid, then shovel into a container for disposal by burying. Wash the floor with a weak lye solution to remove any trace of pesticide. **Spills on wooden floors:** use same procedure as for concrete floor but repeat washing until odor disappears.  
Decontaminate equipment and empty containers by thoroughly rinsing with water; dispose of rinsings by burying in non-crop land away from water supplies. Crush, break or puncture empty containers and bury with rinsings or deliver them to sanitary landfill dumps.

## DYLOX (trichlorfon)

Chemagro



DANGER POISON

1. FORMULATIONS: Soluble Powder - (80% trichlorfon by weight). Solution - (420 g trichlorfon/L)
2. HOW IT WORKS: Trichlorfon is an organophosphate insecticide which works by contact and ingestion.
3. NUMBER OF APPLICATIONS: Alfalfa - 1 per cutting. Barley, flax, oats, wheat - repeat as necessary prior to head emergence but not after flowering to flax; 1 additional application may be made to barley, oats and wheat after heads emerge from sheath. Canola, sugar beets - repeat as necessary. Corn (field, sweet) - maximum of 3 per season with either formulation.
4. HOW TO APPLY:

**With:** Ground or aircraft equipment.

**Rate:**

Crop	Insect	Powder g/ac	Liquid L/ac
Alfalfa (14)	Alfalfa caterpillar	210-280	0.4-0.6
	alfalfa webworm	140-160	0.28-1.1
	beet armyworm, variegated cutworm	280-610	0.6-1.1
	Lygus bugs, stink bugs, tarnished plant bug	610	1.1
Barley, flax, oats, wheat (all 21)	Armyworms (common and true, western yellow-striped)	280	0.6
	Beet webworm, variegated cutworm	280-610	0.6-1.1
	Bertha armworm	610	1.1
Canola (21)	Beet webworm	280	0.6
	Diamondback moth	610	1.1
Corn (field, sweet)(0)	Armyworms, cutworms	280-610	0.6-1.1
Sugar beet (14)	Beet webworm	140-280	0.3-0.6
	Dipterous leaf miners, variegated cutworm	280-610	0.6-1.1
	Beet armyworm	610-910	1.1-1.6

**NOTE:**

- (a) Pre-harvest or pre-grazing interval (days) given in brackets after crop.
- (b) Where a rate range is specified, use the low rate for immature insects, light infestations or sparse foliage.
- (c) Exception: webworm control on sugar beets, use higher rate with low volume aerial application.

5. APPLICATION TIPS: Powder dissolves readily in water and is suitable for use in all power-operated ground sprayers and aircraft sprayers. To dissolve, pour the required amount into full amount of water and then agitate. Use immediately after mixing. Soluble powders should be used in sprayers equipped with 0.3 mm or larger screens. If 0.15 mm screens are used, some screen clogging may occur. Trichlorfon is a selective insecticide: beneficial insect species are less affected. This selective advantage is lost when product is used in conjunction with or alternated with non-selective pesticides. **Corn:** for early applications to control armyworms and cutworms, spray when plants are 7.5-30 cm high; direct the spray to the lower portions of the plant.

6. GRAZING RESTRICTIONS: Sugar beets - do not feed tops harvested within 28 days of treatment.

7. TOXICITY: Acute oral LD<sub>50</sub> rats (mg/kg) = (144).

8. PRECAUTIONS, FIRST AID: Wear standard protective clothing (see page 2) to protect skin and eyes. Do not inhale spray mist. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical attention.

9. STORAGE: Store the liquid formulations above 0°C and away from excessive heat and open flame. Store in an area specially designated for pesticides. Do not store near any material intended for use of or consumption by humans or animals.

## FURADAN (carbofuran)

Chemagro



DANGER POISON

1. FORMULATIONS: 10G and CR-10 (10% carbofuran). Flowable - (480 g carbofuran/L).
2. REGISTERED MIXES: Flowable formulation may be tank-mixed with phenoxy ester or amine herbicides and should be used only on crops listed on both labels. Compatible with most fungicides. Do not mix with Bordeaux mixture or hydrated lime.
3. HOW IT WORKS: Carbofuran is a broad-spectrum, systemic, carbamate insecticide, acaricide and nematicide.
4. NUMBER OF APPLICATIONS: Granular - 1 per season. Flowable: Oilseeds - for flea beetle control, 1 application at 110 mL/ac or 2 applications totalling no more than 110 mL/ac. Grains and forages - 2 applications at 110 mL/ac or, for alfalfa weevil, 1 at 225 mL/ac. Corn - 4 applications for corn borer. Potatoes - repeat as necessary.

## 5. HOW TO APPLY:

## (a) Granular

## Rate:

Crop	Insect	Formulation	kg/ac
Canola, mustard	Flea beetles	CR-10	1.1
Potato	Colorado potato beetle, potato flea beetle, leafhoppers	10G	13.2 (using 90 cm row spacing or 300 g/100 m of row)
Sugar beet	Sugar beet root maggot	10G	3.4

NOTE: - Use the higher rate if a severe infestation is anticipated.

Incorporation: **Canola, mustard**: for seed drill application only; not valid for application with discer seeders. Efficacy can be reduced by harrowing after seeding. Mix granules and seed thoroughly. Check for accurate calibration. **Potatoes**: apply as a 10 cm wide band into seed furrow or drill into the soil 10 cm on each side of row and 5 cm below seed. **Sugar beets** apply directly into seed furrow at same depth as seed or slightly above seed. Do not mix seed, fertilizer and insecticide in same hopper.

## (b) Flowable

With: Ground or aircraft equipment.

## Rate:

Crop	Insect	mL/ac
Alfalfa(7)	Alfalfa weevil	225
Alfalfa(1); barley(21); canola(60); corn (sweet(7), field(3)); flax(21); mustard(21); oats(21); pasture(1); sweet clover(28); wheat(21)	Grasshoppers	110
Canola(60), mustard(21)	Flea beetles	60-110
Corn (field, silage, sweet)(7)	Red turnip beetle	110
Potato(7)	European corn borer	445
	Any of: aphids, potato flea beetle, potato leafhopper or tarnished plant bug alone or in combination with Colorado potato beetle.	445
Potato(7)	Colorado potato beetle	225

## NOTE:

(a) Pre-harvest or pre-grazing interval (days) given in brackets after crop.

(b) Canola - use the higher rate for severe infestations.

(c) Potatoes - use 690 mL/ac if large numbers of aphids are present.

Water Volume: Ground application - not less than 40 L/ac, use sufficient water for thorough coverage. Aerial application - not less than 20 L/ac. Potatoes - use 325-405 L/ac at a minimum pressure of 275 kPa.

6. APPLICATION TIPS: Check the label for calibration of various types of granular applicators. If seed decay, seedling blight or damping-off diseases are a problem, treat seed with a recommended fungicide. Canola and mustard may also require a foliar treatment after seeding with granules. Check fields shortly after emergence. Alfalfa - apply when 25% of tips show feeding damage by alfalfa weevil. In general, apply foliar sprays when insects or feeding damage first appears. Boom sprayers - equip with hydraulic or mechanical agitation and 0.3 mm screens; remove any felt filters.

7. GRAZING RESTRICTIONS: Sugar beet tops and pulp may be fed to livestock without causing residues in milk or meat.

8. TOXICITY: Acute oral LD<sub>50</sub> rats (mg/kg) = (11).

9. PRECAUTIONS, FIRST AID: Wear coveralls and goggles at all times. NEVER handle product with bare hands. Use rubber or neoprene gloves, do NOT use leather gloves. Change clothes each day. Wash clothes in detergent, bleach and hot water. Take a bath at the end of each day. Do not breathe spray mist or dust. **Symptoms of poisoning**: blurred vision, nausea, excessive perspiration, weakness, headache, light-headedness, constriction of pupils, cramps, salivation and vomiting.

**First Aid:** IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Repeat until vomit is clear. Victim should be lying face down or on the side with head below foot level. Secure medical attention immediately.

10. STORAGE: Protect flowable from freezing.

**GASTOXIN, PHOSTOXIN (phosphine)**  
Sanex Inc.



1. FORMULATIONS: 3 g tablets (release 1 g phosphine upon decomposition). 0.6 g pellets (release 0.2 g phosphine upon decomposition).
2. MARKETING CATEGORY: Restricted. A permit must be obtained from your local Agricultural Fieldman or Alberta Environment prior to purchase or use of these products.
3. REGISTERED USES: Raw agricultural products, grain, processed foods and feeds.
4. HOW IT WORKS: Phosphine (hydrogen phosphide) is a colourless gas with a carbide-like odour and high volatility. Formulated product consists of aluminium phosphide, ammonium bicarbonate, urea and paraffin. Upon exposure to air, the ammonium bicarbonate breaks down to form ammonia (a pungent, warning gas) and carbon dioxide (a fire suppressant). Within 1-4 hours, depending on temperature and humidity, the product begins to release phosphine and decompose. The effectiveness of fumigation is primarily dependent upon temperature, tightness of seal, the type of storage space, exposure time and dosage.
5. INSECTS CONTROLLED:
 

almond moth	dermestids	granary and rice weevils	Mediterranean flour moth
Angoumois grain moth	dried fruit moth	Indian meal moth	raisin moth
bean weevil	flat or rusty grain beetle	khapra beetle	saw-toothed grain beetle
cadelle	flour beetles	lesser grain borer	tobacco moth
6. HOW TO APPLY:
 

**Rate:** Raw agricultural commodities, grain and bulk animal feeds: 4-6 tablets/m<sup>3</sup> (60-180/1000 bu.), or 5-10 pellets/m<sup>3</sup> (120-300 pellets/1000 bu.).  
 Processed foods - 16 tablets/10 m<sup>3</sup> (30-60/1000 ft.<sup>3</sup>) or 6 pellets/m<sup>3</sup> (100-200/1000 ft.<sup>3</sup>) of storage space.

**Exposure Times:**

Commodity temp. °C	Exposure time (tablets)*
over 20	3 days
16-20	4 days
12-15	5 days
5-11	10 days
below 5	*Pellets-1 day less

**Do not fumigate**

**Protective Equipment:** It will be necessary to wear a gas mask if: (a) structure under fumigation must be entered in case of emergency or (b) a structure must be entered to commence aeration procedure. Otherwise, it is not necessary to wear a gas mask when product is applied according to label directions. Wear gloves when handling the product.
7. APPLICATION TIPS: **General:** NEVER fumigate alone. Have appropriate gas detection devices available for use as needed. NEVER fumigate any structure or area unless it is unoccupied. Aerate finished food for 48 hours before it is offered to the consumer. **Fumigating Flat Storages (Quansets, granaries):** Make certain that the structure is tight enough to be fumigated successfully. Seal structure as needed. Make certain that there are no adjoining structures occupied by man or animals. During fumigant application leave all doors or other openings open to create a cross ventilation. Application can proceed for 2-4 hours or until the odor of phosphine is detected in the overspace. Apply the tablets or pellets by using a probe. Make probes every 4-5 feet horizontally across the grain in both directions. The number of tablets or pellets used per probe is determined by dividing amount of fumigant to be used by number of probings to be made. Fumigant is dropped in the probe at intervals as the pipe is withdrawn from the grain. A plastic tarp may be pulled over the grain surface following application. This reduces convection currents and increases the effectiveness of the fumigant. Care must be taken to see that the plastic is removed when fumigation is completed (no more than 5-6 days or sweating of grain may occur). Close and seal all external openings. Placard and lock all entrances. Following the exposure period, open doors and windows creating a cross draft to aid in aeration. Make certain all warning signs are removed when aeration is complete. **Fumigation of Railcars:** Boxcars and hopper cars of bulk raw agricultural commodities and animal feeds are fumigated in the same manner as are silos or flat storages. Tablets or pellets may be added to the commodity as it flows into the railcars, placed on the floor of empty car, placed on the surface of commodity, or probed after loading is completed. Processed foods and bagged raw commodities and animal feeds are fumigated by placing tablets or pellets in moisture permeable envelopes or on trays, which in turn are fastened to a substantial support within the car. Care must be taken to see that fumigant or its reacted residue does not come in contact with processed foods. Close and seal all hatches or doors. Approved warning signs must be applied to each door of box cars and near the ladder on hopper cars as well as on top hatch covers. Date signs as to when fumigation commenced and when the car may be opened. Notify the consignee that the car is to be received under fumigation. **Fumigating Silo Type Storages (Granaries):** Calculate required number of tablets or pellets based on dosage selected and quantity of commodity to be treated. Open all containers outside the building. Tablets may be applied to grain on the transfer belt by hand. Pellets are best applied using an automatic pellet dispenser. They may be dispensed into the up leg of elevator from workroom floor, or onto grain as it travels along the transfer belt on bin floor.
8. TOXICITY: Hydrogen phosphide gas is very toxic to all forms of animal life, and exposure to even small amounts should be prevented. Poisoning results from ingestion or inhalation as hydrogen phosphide is not absorbed through the skin. It is also insoluble in water, fats, and oils.
9. PRECAUTIONS, FIRST AID: Open containers only in open air and with the opening pointing away from your face. Wear

gloves when handling the product. Use entire contents of a tube once it is opened. Unopened tubes and resealable flasks may be returned to the locked storage area for later use. Wash hands after use of the product.

NEVER let tablets or pellets come in direct contact with liquid - this causes the immediate release of hydrogen phosphide. NEVER confine the product in small gas proof enclosures such as plastic bags. Such confinement could cause the gas concentration to reach the lower flammability level. Take precautions in areas where copper, brass or gold are present, as corrosion may occur. NEVER fumigate in areas containing electronic or telephone equipment, photographic film or copy paper. It may be possible to remove such items or protect them from exposure to the gas. Suggested exposures should be observed. A shortened exposure period cannot be compensated for by increased dosage. Hydrogen phosphide has great penetrating power and gas may slowly seep through concrete block walls. See that adjoining areas are not used as living quarters during the fumigation period. Hydrogen phosphide does not layer, but expands to fill the available space. Because of its high volatility and penetrating ability, the enclosure being treated must be sealed as tightly as possible if an effective fumigation is to be expected.

**Symptoms of poisoning:** Severity is dependent on concentration of hydrogen phosphide involved. Mild poisoning results in fatigue, nausea, pressure or pain in the chest, ringing in the ears, and uneasiness. Hydrogen phosphide is not a chronic poison, and these symptoms will readily disappear with rest and fresh air. Greater quantities of gas produce such symptoms as vomiting, stomachache, diarrhea, disturbance in equilibrium, and dyspnea (difficulty in breathing). Very high concentrations quickly cause bluish-purple skin color, agitation, poor muscle co-ordination, sub-normal blood oxygen content, unconsciousness and death. Death can occur very quickly, or be delayed several days as a result of pulmonary edema and collapse, by paralysis of the central respiratory system. In cases of severe poisoning, disturbance in liver and kidney function can also occur.

**First aid:** Should exposure to hydrogen phosphide be documented or suspected: Remove patient from gas atmosphere to open air. CALL A PHYSICIAN IMMEDIATELY. Have patient lay down, keeping him warm and comfortable. Treat as for shock. Make NO antidotal use of fats, oil, butter, or milk. Do NOT administer atropine as it is contraindicative. Commence artificial respiration if breathing has ceased. When exposure to low concentrations of hydrogen phosphide have been documented or suspected, the individual involved should rest for 24 hours and under no circumstances should he resume any work dealing with fumigation.

10. **STORAGE:** Tablets and pellets are received in wooden cases containing sealed tubes and cans, or resealable flasks. As long as the tubes, cans or flasks remain intact, the storage life of the product is unlimited. Storage should be in a dry, locked, ventilated area and out of the reach of children and irresponsible persons.

**GUTHION (azinphos-methyl)**  
Chemagro



1. **FORMULATIONS:** Spray concentrate (SC) - (240 g azinphos-methyl/L).  
Wettable powder (WP) - (50% azinphos-methyl)
2. **HOW IT WORKS:** Azinphos-methyl is a contact, non-systemic, organophosphate insecticide and acaricide.
3. **NUMBER OF APPLICATIONS:** One per season on barley, oats, rye, sugar beets, wheat. One per season on alfalfa and clover except 2 per season for sweet clover weevil control or when using rates of 910 mL SC/ac or less. Repeat as necessary on canola and potatoes.
4. **HOW TO APPLY:**

**With:** Ground or aircraft equipment.

**Rate:**

<b>Crop<sup>(a)</sup></b>	<b>Insect</b>	<b>Liquid</b> <b>Qty/ac</b>	<b>Powder</b> <b>Qty/ac</b>
Alfalfa (21), Clover (21)	Alfalfa plant bug, alfalfa weevil, aphids, grasshoppers, leafhoppers, lygus bugs, sweet clover weevil	0.9-1.4 L 0.425-0.7 L 910 mL	445-710 g 445 g
Canola (30)	Diamondback moth Flea beetles	225-505 mL 110-225 mL	110-225 g 60-110 g
Canola (30)	Red turnip beetle	225-345 mL	110-170 g
Cereals (30)	Grasshoppers	0.425-0.7 L	
Potato (7)	Aphids Colorado potato beetle	1.4 L 510-710 mL	710 g 225-345 g
Potato (7)	Flea beetle, leafhoppers, spittle bug, tarnished plant bug	0.9-1.4 L	445-710 g
Sugar beet (100)	Flea beetles	110 mL	60 g

**\*NOTE:**

(a) Pre-harvest interval (days before cutting for food, feed or forage) given in brackets after crop.

(b) Rate range - use the lower rate on immature insects, light infestations or sparse foliage.

**Water Volume:** Minimum of 32 L/ac with ground equipment and 16 L/ac with aerial application. Alfalfa weevil - use 60-80 L/ac on heavy growth.

**Nozzles:** When spraying canola and sugar beets, wettable powder may be applied using any commercial tractor, or drawn or self-propelled field sprayer provided it is equipped with the following:

(a) nozzle tips no finer than 6502, 8002 or TK2 with nozzle screens no finer than 0.3 mm. These tips will provide 40 L/ac when operated at 8 km/hr and 200 kPa.

(b) 0.3 mm or larger line strainers or screens. Note that felt filters, smaller nozzle tips or smaller screens will become clogged when using the wettable powder formulation.

**5. APPLICATION TIPS:** For red turnip beetle, spray an 18-30 m wide band around the field or where beetles are causing damage. Repeat as necessary. **Mixing:** The wettable powder mixes easily with water. Mix the required amount of powder with a small quantity of water. Add this pre-mix through the screen while filling the sprayer tank or fill the tank to the required level and then add the pre-mix. Operate the agitator while mixing.

The spray concentrate forms an emulsion when diluted with water and is suitable for use in all power-operated ground sprayers and aircraft sprayers. To mix, pour the required amount of spray concentrate into full amount of water and then agitate.

**6. GRAZING RESTRICTIONS:** Do not graze treated areas within 21 days of application.

**7. TOXICITY:** Acute oral LD<sub>50</sub> rats (mg/kg) = (11). Highly toxic to bees exposed to direct treatment or residues on crops. Poisonous if swallowed, inhaled, or absorbed through the skin.

**8. PRECAUTIONS, FIRST AID:** **KEEP OUT OF REACH OF CHILDREN.** Do not get in eyes or on skin. Wear protective clothing, natural rubber gloves, and goggles. Do not breathe dust or spray mist. Wear a pesticide respirator. **DO NOT USE** on greenhouse food crops or other crops used for food or forage. Use only according to label directions. Application at rates above those shown may result in illegal crop residues. To protect fish and wildlife, do not contaminate streams, lakes, or ponds. Do not apply when crop is in bloom or allow spray to drift towards beehives. **DO NOT CONTAMINATE FEED OR FOOD.** Keep all unprotected persons out of the operating area or vicinity where there may be danger of drift. Workers who must enter treated fields within 2 days of application should wear protective clothing. Wash hands, arms, and face thoroughly with soap and warm water before eating or smoking. Wash all contaminated clothes with soap and hot water

before reuse. **Symptoms of poisoning:** tightness in the chest, sweating, contracted pupils, stomach pains, vomiting and diarrhea.

**First Aid:** CALL A PHYSICIAN IMMEDIATELY. Have patient lie down and keep quiet. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Repeat until vomit fluid is clear. The patient should be lying down with the head below the foot level and facing down or to the side.

**FOR THE PHYSICIAN:** Compound inhibits cholinesterase, resulting in stimulation of the central nervous system, the parasympathetic nervous system, and the somatic motor nerves. Do NOT give morphine. Watch for pulmonary edema which may develop in serious cases of poisoning even after 12 hours. At first sign of pulmonary edema, the patient should be placed in an oxygen tent and treated symptomatically. **ANTIDOTE:** Administer atropine sulfate in large therapeutic doses. Repeat as necessary to the point of tolerance. 2-PAM is also antidotal and may be administered in conjunction with atropine

9. **STORAGE:** Do not store spray concentrate below -4°C. Protect products from heat and open flame. Do not heat.
10. **DECONTAMINATION AND DISPOSAL:** Do not reuse container. Completely empty the container. Rinse empty drum by filling with water and adding 250 mL household lye/25 L water; punch holes in top and bottom and crush. Bury unused chemical, rinse solution and crushed container at least 50 cm deep in a non-crop, non-graze area away from water supply.

**LANNATE, NUDRIN (methomyl)**  
DuPont



1. FORMULATIONS: Solutions - Lannate L (215 g methomyl/L).  
- Nudrin (216 g methomyl/L)

2. HOW IT WORKS: Methomyl is a carbamate insecticide which works by contact and ingestion and has some systemic action. Rapidly degraded in green, growing plants; short-term residual. Rapid knock-down.

3. NUMBER OF APPLICATIONS: As needed, no restriction on number of applications per season.

4. HOW TO APPLY:

With: Ground equipment (all crops) or aircraft (canola, flax, wheat, oats and barley).

**Rate:**

**Crop**  
Canola (8)

<b>Insect</b>	<b>L/ac</b>
Alfalfa looper, bertha armyworm, beet webworm, clover cutworm	0.4-0.5

Corn, sweet (3)	Corn earworm	0.8-1.1
	European corn borer	1.1

Flax (8)	Bertha armyworm, flax bollworm	0.4-0.5
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Potato (3)	Aphids, flea beetles, leafhoppers	0.9
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Wheat (20), oats (20), barley (20)	Common armyworm	0.5-0.9
	Thrips	0.5

**NOTE:**

(a) Pre-harvest interval (days) given in brackets after crop.

(b) When a rate range is specified, use the low rate only for very young insects, small plants or light infestations.

**Water Volume:** Ground spray - use 20-60 L/ac; Aerial spray - use a minimum of 16 L/ac.

5. APPLICATION TIPS: Apply at the recommended rates in sufficient water to obtain thorough, uniform coverage. Best control is obtained when spray schedules are initiated on young insects. Repeat application as necessary. Early morning or late evening sprays are recommended. **Sweet corn:** for earworm, spray whorls as needed and silks at 2-4 day intervals or as needed; for European corn borer consult your district agriculturist - spray at 3-5 day intervals or as needed when insects first appear.

6. TOXICITY: Acute oral LD<sub>50</sub> rats (mg/kg) = (17). Toxic to bees. May cause blindness if swallowed or inhaled.

7. PRECAUTIONS, FIRST AID:

Sodium hydroxide causes burns. Do not get in eyes or on clothing. Wear a respirator and protective gear (goggles, boots and gloves) to avoid contact with skin and eyes. Extremely flammable. Use in an adequately ventilated area. Aircraft pilot should not assist in the mixing and loading operation. Apply when bees are not foraging. **Symptoms of poisoning:** weakness, blurred vision, headache, nausea, abdominal cramps, discomfort in the chest, constriction of pupils, sweating, slow pulse, or muscle tremors.

**First Aid:** IF IN EYES or ON SKIN - use standard first aid measures (see page 3). MEDICAL ATTENTION IS NECESSARY IN ALL CASES. Atropine is an antidote. Consult physician for an emergency supply of 1/100 grain atropine tablets. If symptoms appear before a physician arrives, immediately swallow 2 atropine tablets (each 1/65 mg); thereafter, every 10-15 minutes, take 1 atropine tablet until the throat becomes dry and the skin becomes dry and flushed. Take additional tablets as necessary to maintain a moderately dry throat and dry, flushed skin until a physician is available.

8. STORAGE: Do not store below 0°C. Above 136°C, product decomposes and may explode if confined.

9. DECONTAMINATION AND DISPOSAL: **Spill or Leak Procedure:** Do not get in eyes, on skin or clothing. Keep people away and upwind of spill/leak. If necessary to enter the spill area, wear self-contained breathing apparatus, gloves, boots and protective clothing. Try to remove leaking containers and put them into leak-proof containers. Sweep up spills; apply earth, sand or sweeping compound to spill area and re-sweep to pick up residue. Package spill material in plastic, cardboard or metal containers; bury in a safe place away from water supplies. If product enters crevices and cannot be effectively swept, treat with a sodium hydroxide (Drano) water solution and allow to stand 4 hours. Thereafter, flush well with water; do not flush into any body of water. If product enters sewers or bodies of water, notify appropriate local and federal authorities.

**LINDANE (gamma BHC)**

Chipman / Uniroyal



DANGER POISON

1. **FORMULATIONS:** Dusts (12-75% gamma BHC by weight), Solutions (15.7-21.5%), Suspensions (10-49.9%), Wettable powders (16.6-50%).
2. **REGISTERED MIXES:** Most commercial formulations of lindane for seed treatment are mixed with 1, 2 or 3 fungicides (any of: benomyl, captan, carbathiin, maneb, TCMTB, thiram). The insecticide diazinon is added to some.
3. **HOW IT WORKS:** Lindane is an organochlorine insecticide which works by ingestion and contact.
4. **HOW TO APPLY:**  
**With:** Seed treater or as a drill-box mix.  
**Rate:**

Crop	Insect	Rate
Canola, cereals, corn, sugar beets, (seed treatments)	Flea beetles, wireworms	Varies with formulation; follow label for specific dosage
5. **APPLICATION TIPS:** Use mineral oil or linseed oil as a sticker (150 mL/25 kg seed) when applying the higher rate of dust as a seed treatment for severe flea beetle infestation by:
  - (a) mixing oil and seed to coat,
  - (b) mixing again with dust and,
  - (c) using planting equipment that can be satisfactorily adjusted to compensate for the increased coating on the seed.
6. **GRAZING RESTRICTIONS:** Do not use treated seed for feed, food or oil processing. Do not graze or feed livestock on treated areas for 4 weeks after planting.
7. **TOXICITY:** Acute oral LD<sub>50</sub> rats (mg/kg) = (88-91).
8. **PRECAUTIONS, FIRST AID:** Read the label before using any product. Wear protective gear to avoid contact with skin or eyes. Do not inhale dust. Work in a well ventilated area. Change clothes daily. If treated seed is to be stored label as "**POISONOUS TO MAN AND ANIMALS. Do not use as feed. This seed is treated with Lindane for control of insects.**" **Symptoms of poisoning:** nausea, vomiting, hyperirritability, convulsions, and coma.  
**First Aid:** IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical attention immediately.
9. **STORAGE:** Solution products may be frozen; crystals will dissolve when warmed to 0°C. **NOTE:** Freezing can damage the container. Protect suspensions from low temperatures.

**LORSBAN 4E (chlorpyrifos)**

Dow



DANGER POISON

1. FORMULATION: Emulsifiable concentrate - Lorsban 4E (480 g chlorpyrifos/L).
2. HOW IT WORKS: A broad-spectrum, non-systemic insecticide. Works by contact, ingestion and vapour action.
3. NUMBER OF APPLICATIONS: Once per season as (a) a foliage treatment of barley, oats, wheat and canola, (b) as a seedling or soil treatment of potatoes and (c) as a seedling treatment of canola, flax, sugar beet and sunflower. Not more than 9 weekly applications on potato foliage.
4. HOW TO APPLY:
 

**With:** Ground or aerial equipment

**Rate:**

Crop	Insect	mL/ac
Seedling potatoes and corn (both 70)	Cutworms	490-970
Seedling canola, flax (both 21), seedling sugar beet (90)	Cutworms	350-490
Seedling sunflower (90)	Cutworms	490
Foliage: barley, oats, wheat (all 60)	Armyworm, cutworms grasshoppers (young) (all stages) Wheatmidge	350-490 235 400 300
Foliage: potato (7)	Potato flea beetle, tarnished plant bug, Colorado potato beetle	400
Foliage: canola (21)	Bertha armyworm, alfalfa looper Diamondback moth (larva) Common armyworm, grasshoppers	300-400 400 350-400

**NOTE:**

(a) Pre-harvest interval (days) given in brackets after crop. Wait-interval for canola is counted from day of processing.

(b) Rate range - use lower rate for young insects, light infestations or sparse foliage.

**Water Volume:** Seedling canola and flax - 32-80 L/ac by ground, 4-8 L/ac by air; seedling sugar beet and sunflower - 32-80 L/ac; barley, oats and wheat foliage - 20-80 L/ac; potato foliage - 160-325 L/ac; canola foliage - 16 L/ac by ground, 4 L/ac by air; all other applications require 80-160 L/ac.

5. APPLICATION TIPS: **Cutworms:** Use the higher rates when the top 1 cm of soil surface is extremely dry or when the infestation is heavy. Early evening applications are best. Apply when damage first appears. Foliage treatments: when spraying crops near maturity, an application system that gives maximum penetration of the crop canopy is necessary to get good insect kill.

6. TOXICITY: Acute oral LD<sub>50</sub> rats (mg/kg) = (135-163). Toxic to bees.

7. PRECAUTIONS, FIRST AID: Wear protective gear to avoid contact with skin or eyes. Do not inhale vapours or spray mist. Do not apply to blooming crops. **Symptoms of poisoning by inhalation include:** stuffy, runny nose, scratchy throat, asthmatic wheezing, sudden bronchospasm, swelling of oral and laryngeal mucous membranes, shock. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - do NOT induce vomiting. Get medical attention immediately.

# MALATHION, CYTHION (malathion)

Cyanamid



CAUTION POISON

1. FORMULATIONS: Emulsifiable concentrates - 500E, 500, 50% (500 g malathion/L). Grain Protectant - Liquid (1 kg malathion/L). Deodorized - Dust (2% malathion).
2. HOW IT WORKS: Malathion is a non-systemic, contact, organophosphate insecticide and acaricide of brief to moderate persistence. Generally non-phytotoxic. Not effective below 20°C (does not apply for control of stored grain insects).
3. HOW TO APPLY:

**(a) Emulsifiable Concentrates**

With: Ground equipment or aircraft equipment.

Rate:

Crop	Insect	L/ac
Alfalfa (7), clover (7),	Alfalfa weevil larvae, aphids grasshoppers, leafhoppers, lygus bugs, spittle bug adults	0.9-1.1
Canola (7), mustard (7)	Flea beetles, grasshoppers Diamondback moth larvae	0.4-0.7 0.2-0.3
Flax (7), pastures (0)	Grasshoppers	0.4-0.7
Cereals (7), hay (7)	Grasshoppers English grain aphid	0.7 0.8-1.1
Potato (3)	Aphids, Colorado potato beetle, leafhoppers	0.6-0.8
Sugar beet	Flea beetles	0.4
Sweet clover	Sweet clover weevil	0.6-1.0

NOTE:

(a) Pre-harvest or pre-grazing interval (days) in brackets following crop.

(b) Rate ranges: use lower rate for immature insects, light infestations or sparse foliage.

Water Volume: For potato pests, use recommended rate in 400 L/ac finished spray.

**(b) Grain Protectants**

With: Spray or dust application.

Rate:

Insect	Grain	mL/1000 mL	g/kg Grain
		Liquid	Dust
Flour and grain beetles, grain mites	Barley	12	520
	Corn	10	
	Oats	17	735
	Rye	10	450
	Wheat	10	415
Indian meal moth	Barley, corn, oats, rye, wheat	300 mL/100 m <sup>2</sup> of grain surface	

NOTE: Stored grain should not be offered for sale until 7 days after treatment.

Water Volume: For Indian meal moth, use the recommended rate in 5-10 L water. For all other pests, use the recommended rate in 10-20 L water.

Incorporation: Scatter proper amount of dust on each load and cut in with shovel before dumping or add grain as it is being augered.

4. APPLICATION TIPS: **Alfalfa and clover:** apply when about 75% of foliage shows weevil feeding damage. Do not apply when crop is in bloom. **Sugar beet:** apply at 3-5 leaf stage when insects or damage first appears. **Sweet clover:** spray field margins of first year clover in late summer or early fall when migration of weevil adults is occurring. **All crops:** Apply when day temperature is expected to exceed 20°C. **Stored Grain:** to protect from attack by Indian meal moth, apply spray evenly over the surface of clean or uninfested grain and rake to a depth of 15 cm. Apply immediately after grain is loaded into storage. For control of pests in grain on the farm, where special application equipment is not available, any type of low pressure sprayer holding 5 L or more can be used. Spray can be applied to the grain stream as grain is being elevated into storage. First, test sprayer calibration by discharging into a tank of water, then regulate flow of grain to get the proper rate of spray. Keep spray coarse to avoid loss as "drift". **Before storing new grain:** thoroughly clean up old grain and debris from bins, elevators, or grain handling equipment. Remove and burn all sweepings. After cleaning the premises, apply a residual malathion spray to walls, floors and machinery in grain elevators or farm storage, using a solution containing 200 mL Grain Protectant/5 L water. Make sure the spray is forced into cracks and crevices. Apply at the rate of 5 L of spray/100 m<sup>2</sup> of surface area using a coarse wetting spray. Wait until spray has thoroughly dried before storing

grain in treated areas. This same spray should be applied around the outside of bins and elevators to help prevent re-infestation.

5. GRAZING RESTRICTIONS: **Forages and pasture:** remove cattle before spraying; cattle may be returned immediately after spraying.
6. TOXICITY: Acute oral LD<sub>50</sub> rats (mg/kg) = (2,800). Toxic to bees.
7. PRECAUTIONS, FIRST AID: Wear protective gear to avoid contact with skin or eyes - do not inhale vapour, spray mist or dust. Do not apply to plants in bloom. **Symptoms may include:** headache, weakness, sweating, giddiness, blurred vision, nausea, abdominal cramps, diarrhea, and discomfort in chest.  
**First Aid:** IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical attention.
8. DECONTAMINATION: Malathion breaks down rapidly in the presence of water and alkaline materials. Containers and spillages can be readily decontaminated by use of Javex or lye, or washing soaps containing sodium hydroxide. Residues of malathion can be buried in a suitable disposal area. First, place a layer of soda ash or hydrated lime at the bottom of a pit, then pour in the malathion, add another layer of soda ash or lime, Finally, cover with a mixture of Javex and water and top with soil. The amount of soda ash or lime and Javex will be dependent upon the amount of malathion to be decontaminated.

**METHOXYCHLOR, MARLATE (methoxychlor)**

Numerous Manufacturers



CAUTION POISON

1. **FORMULATIONS:** Emulsifiable concentrates - (240 g methoxychlor/L)
2. **REGISTERED MIXES:** Methoxychlor and a fungicide (e.g. captan)/seed treatments.
3. **HOW IT WORKS:** Methoxychlor is a non-systemic, organochlorine insecticide which works by contact and ingestion. Not for aphids or mites. Short residual.
4. **NUMBER OF APPLICATIONS:** Repeat as necessary at intervals of 7-10 days (alfalfa and clover with insects other than armyworm, potatoes); 7-14 days (for armyworm on alfalfa, clover, wheat, oats, rye, barley and corn).

**5. HOW TO APPLY:**

With: Ground or aircraft equipment.

**Rates:**

Crop	Insect	L/ac
Alfalfa, clover	Alfalfa weevil, sweet clover weevil, flea beetles, leafhoppers, grasshoppers	2.0-2.6
Alfalfa, clover, wheat, corn, oats, barley, rye	Armyworm	2.8-4.9
Potato	Blister beetle, Colorado potato beetle, flea beetles, leafhoppers	1.3-4.3

**NOTE:**

(a) Pre-harvest or pre-grazing interval for foliage application is 7 days for crops listed.

(b) Rate range - use lower rate for immature insects, light infestations or sparse vegetation.

**Water Volume:** Aerial application - use 12-40 L/ac. Ground application - use sufficient water for good coverage.

6. **APPLICATION TIPS:** Apply when insects or damage first appears or, for alfalfa weevil, when 60-75% of alfalfa tips show feeding damage. Methoxychlor is the safest insecticide to use on alfalfa seed crops for alfalfa weevil control during the pollination period. Applications should be made in the late evening.
7. **GRAZING RESTRICTIONS:** Do not feed treated potatoes or potato refuse to livestock.
8. **TOXICITY:** Acute oral LD<sub>50</sub> rats (mg/kg) = (6,000).
9. **PRECAUTIONS, FIRST AID:** Wear protective gear to avoid contact with skin or eyes. Do not inhale vapours or spray mist. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - do NOT induce vomiting if the product contains petroleum distillate. Read the label for directions. Get medical attention.
10. **STORAGE:** If product is exposed to prolonged cold, place in warm storage at 10-20°C for several hours; agitate before using.

**MONITOR (methamidophos)**  
Chemagro



1. FORMULATIONS: Solution (480 g methamidophos/L)
2. REGISTERED MIXES: Compatible with most commonly used fungicides.
3. HOW IT WORKS: Methamidophos is a broad spectrum organophosphorus insecticide and acaricide which works by contact and systemic action. Non-phytotoxic when used as directed. Contact effectiveness may persist for 7-21 days.
4. NUMBER OF APPLICATIONS: Two per season on canola. Repeat as necessary on potatoes.
5. HOW TO APPLY:  
With: Ground or aircraft equipment.  
**Rate:**

Crop	Insect	L/ac
Canola (10)	Bertha armyworm	0.3-0.5
	Grasshoppers	0.5
Potato (14)	Aphids, Colorado potato beetle, potato flea beetle, potato leafhopper	0.7-0.9

**NOTE:**  
(a) Pre-harvest interval (days) given in brackets after crop.  
(b) Rate range - use the higher rate for severe infestations, adult insects, or dense foliage.  
**Water Volume:** Ground application - 80-400 L/ac. Aerial application on canola - use not less than 4 L/ac.

- 6. APPLICATION TIPS: Apply when insects or damage first appears. Potatoes - apply at 10-14 day intervals or as necessary.
- 7. TOXICITY: Acute oral LD<sub>50</sub> rats (mg/kg) = (30). Extremely toxic to wildlife. Highly toxic to bees exposed to direct treatment or residues on crops.
- 8. PRECAUTIONS, FIRST AID: Do not inhale vapours or spray mist. Wear a protective respirator suitable for protection against organophosphorous insecticides. Wear standard protective clothing (see page 2), rubber gloves, and goggles. Keep unprotected personnel out of mixing and spray area. DO NOT APPLY under conditions involving possible drift to food, forage or other planting that might be damaged or the crops thereof rendered unfit for sale, use or consumption. KEEP OUT OF LAKES, STREAMS AND PONDS. Fish will be killed if their waters are contaminated. Avoid using during pollination period. **Symptoms of poisoning:** tightness in the chest, sweating, contracted pupils, stomach pains, vomiting and diarrhea. In case of poisoning get medical attention immediately. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Repeat until vomit fluid is clear. Patient should be lying down with head below the foot level and turned to the side.
- 9. STORAGE: This product is to be stored and displayed apart from food or feed. Do not store in or around the home. Store in a cool, dry place but not below -10°C. Protect from heat.

**PIRIMOR (pirimicarb)**  
Chipman



1. FORMULATIONS: Wettable Powder - WP (50%)
2. REGISTERED MIXES: Pirimor is compatible with thuricide HPC, Dipel, Sevin.
3. HOW IT WORKS: Pirimicarb is a carbonate insecticide which works by contact, vapour and local systemic action. Pirimicarb is specific to aphids and fits into integrated control programs.
4. HOW TO APPLY:

With: Ground or aircraft equipment.

**Rate:**

Crop	Insect	g/ac
Peas (6)	Pea aphid	61-111
Potatoes (7)	Green peach aphid	170-220
	Buckthorn aphid	
Corn, sweet (3)	Aphids	220

**NOTE:**

(a) Pre harvest interval (days) given in brackets after crop.

(b) Rate range - use higher rate when aphid populations are high or when very cool weather is prevailing.

**Water Volume:** Peas - at least 8 L/ac for aircraft. Potatoes - 200-400 L/ac.

5. TOXICITY: Acute oral LD<sub>50</sub> rats (mg/kg) = (147).

6. PRECAUTIONS, FIRST AID: Avoid breathing dust or spray mist. Avoid contact with skin and eyes. Wear standard protective clothing (see page 2), gloves, overalls and eye protection. Wash hands and exposed skin before meals and after work. Change contaminated clothing daily. **Symptoms of poisoning:** blurred vision and/or breathing difficulties. If symptoms occur, move out of sprayed area and call a doctor.

**First Aid:** IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical attention.

**FOR PHYSICIAN:** Pirimor is a moderate, reversible cholinesterase inhibitor. Atropine at 1-4 mg by intramuscular injection is antidotal followed by a further 2 mg every 30 minutes as necessary. P2S and 2-PAM are not effective.

SEVIN (carbaryl)  
Union Carbide/Chipman



WARNING POISON

1. FORMULATIONS: Liquid Suspensions - XLR, SL (480 g carbaryl/L). Wettable Powder - 50W (50% carbaryl). Sprayable Powder - 80S, (80% carbaryl). Chipman Flowable (420 g carbaryl/L).
2. REGISTERED MIXES: Most formulations are compatible with a wide range of pesticides. Liquid formulations are not compatible with diesel fuel, kerosene, fuel oil or aromatic solvents. All formulations are unstable when mixed with alkaline materials such as Bordeaux mixture, lime-sulphur and casein-lime spreaders.
3. HOW IT WORKS: Carbaryl is a carbamate insecticide which works by contact and ingestion. Moderate to rapid in speed of action with short to moderate residual effectiveness (2 days to 4 weeks) depending on crop/pest complex, formulation and climatic conditions.
4. NUMBER OF APPLICATIONS: Repeat as necessary.

5. HOW TO APPLY:

With: Ground or aircraft equipment.

Rates:

Crop	Insect	Formulation	Qty/ac
Canola (seedlings only, up to 4 weeks after emergence)	Flea beetles, grasshoppers	XLR or SL 80S	500 mL 300 g
Cereals (14): barley, oats, rye, wheat	Grasshoppers	XLR SL 50W 80S F	0.5-1.4 L 0.5-1.0 L 450-900 g 300-600 g 0.6-1.1 L
Forages (0): alfalfa, clover	Blister beetles, leafhoppers	XLR or SL 50W 80S F	1.0-1.6 L 0.9-1.3 kg 600-700 g 1.1-1.7 L
	Alfalfa weevil larvae	50W 80S	1.3 kg 910 g
	Alfalfa caterpillar, armyworm, webworms	XLR or SL 50W 80S F	1.0-2.1 L 0.9-1.8 kg 700-900 g 1.1-2.25 L
	Cutworms (climbing species)	50W 80S	0.9-1.8 kg 0.6-1.2 kg
	Sweet clover weevil	50W 80S	0.9-1.8 kg 600-900 g
Corn (1): field, sweet	Grasshoppers	XLR SL	0.5-1.0 L 1.0-1.6 L
	Cutworms (climbing species)	XLR 80S 50W	2.1 L 1.2 kg 42.5 g / 100 m row.
	European corn borer, corn earworm, fall armyworm	XLR or SL 50W 80S F	1.0-1.6 L 0.9-1.3 kg 500-900 g 1.1-1.6
Potato (7)	Cutworms (climbing)	XLR or SL 80S 50W	100-125 mL / 300 m row 29 g / 100 m row 42.5 g / 100 m row
	Colorado potato beetle	XLR or SL F	500 mL 0.6 L
	Flea beetles, leafhoppers	XLR	500 mL
	Colorado potato beetle	50W	4.45 kg
	Potato flea beetles, leafhoppers	80S 50W F	300-600 g 900 g 1.1 L

**NOTE:**

(a) Pre-harvest or pre-grazing intervals (days) given in brackets after crop.

(b) Rate ranges - use the lower rate on immature insects, light infestations or sparse foliage; use the higher rate for adult insects, severe infestations or dense foliage.

**Water Volume:** On all crops, use sufficient water to obtain thorough and uniform coverage (usually between 22-180 L/ac of spray depending on equipment, severity of infestation and stage of crop growth). **Low volume aerial applications:** hot, dry conditions may cause excessive evaporation of droplets. A higher spray volume per acre may be required under hot, dry conditions and when crop canopies are particularly dense. Dilutions greater than 1:11 (XLR:water) not recommended when wash off resistance is desired. Clean lines and tank after spraying. **Liquids:** Use at least 4.0 L/ac of prepared spray in aerial applications and at least 12 L/ac of prepared spray for low volume ground applications. For XLR use as low a water volume as possible, but still achieve good coverage. **Wettable Powder:** Use at least 11-14 L/ac and at least 4-14 L/ac of prepared spray for aerial applications. **Climbing cutworms:** on corn, use at least 90-120 L/ac with XLR or 80S, or 90-140 L/ac with 50W; on forages and cereals, use at least 225 L/ac with 50W or 80S.

**Nozzles:** Low volume applications: For wettable powder, use 50-mesh or coarser screens in entire system; nozzles should be cone type, No. 3 or larger. For XLR, use 50-mesh, in-line strainers and 25-mesh, slotted strainers behind the nozzle; nozzle should be of cone type sizes D6-45 or D8-45. For flowables use finer than 50 mesh screen. **NOTE:** (Flat fan nozzles may be used [sizes 8008-8010] but care should be taken as excessive droplet breakup and resulting production of fine droplets may occur. Flat fan nozzles are also prone to plugging under hot, dry conditions).

**6. APPLICATION TIPS:** Timing and good coverage are essential for effective control. Apply when insects or damage first appears. Prepare only as much spray mixture as is needed on the day of mixing. Do not store spray mixtures overnight. Calibrate spray equipment to deliver the required volume.

For all carbaryl formulations, agitate, stir or recirculate prior to use. Remove oil, rust, scale, pesticide residues and other foreign matter from mix tanks and entire spray system.

A dilution of 1:1 (XLR:water) will allow maximum resistance to rainfall or overhead irrigation. Avoid applying carbaryl just before rainfall. Spray droplets must dry on the foliage to have wash-off resistance. Under low humidity, at least 1 hour drying is adequate. Wash-off resistance cannot be expected when XLR is applied to wet foliage which does not dry before rainfall. **Corn:** for larvae in whorls and for foliage feeders, treat entire plant. For climbing cutworms, spray in a 25-30 cm band over the row. For insects attacking silks and ears, apply, if necessary, at 2-4 day intervals; start when first silks appear and continue until silks begin to dry. Three or more applications may be required depending on the severity of the infestation. **Grasshoppers:** on pasture, rangeland and associated borders, use XLR formulation at 500-900 mL/ac for nymphs or on sparse vegetation, or 0.9-1.4 L/ac for adults or dense vegetation. **Alfalfa Weevil:** if pre-treatment damage is extensive, cut and make application to stubble.

**7. GRAZING RESTRICTIONS:** Remove cattle from area to be sprayed. Cattle may graze immediately after application. Treated forage and feed crops may be fed to dairy animals and animals for slaughter provided sprays are applied as directed.

**8. TOXICITY:** Acute oral LD<sub>50</sub> rats (mg/kg) = (540). Toxic to bees.

**9. PRECAUTIONS, FIRST AID:** Wear protective gear to avoid contact with skin and eyes - do not inhale spray mist. Except for the XLR formulation, Carbaryl should not be applied to crops in bloom. XLR can be applied when bees are not foraging provided the residue on the plants is dry before foraging commences. **Symptoms may include:** salivation, tearing, urination, defecation, pinpoint pupils, muscle spasms, general muscular weakness, nausea, prostration, convulsions.

**First Aid:** IF IN EYES or ON SKIN - use standard first aid measures (see page 3). Get medical attention immediately. IN EMERGENCY, phone collect (24 hours a day) 1-(514)645-5311.

**10. STORAGE:** Do not store where temperature frequently exceeds 38°C. All formulations will withstand freezing.



1. FORMULATION: Emulsifiable concentrate (240 g methidathion/L)
2. REGISTERED MIXES: None. Supracide is compatible with many fungicides.
3. HOW IT WORKS: A non-systemic organophosphate insecticide. Works by contact and ingestion.
4. HOW TO APPLY:

With: Ground or aircraft equipment.

**Rate:**

Crop	Insect	L/ac
Alfalfa (10)	Alfalfa weevil, leafhoppers, lygus	0.4-0.9
	bugs, pea aphid	
	Alfalfa blotchleaf minor	0.7-0.9
Canola (30), mustard	Flea beetles	0.3
	Diamondback moth, red turnip beetle	0.4
Potato (14)	Colorado potato beetle, flea beetles, leafhoppers, tarnished plant bug	0.4
Sunflower (50)	Painted lady butterfly, sunflower maggot, sunflower moth	0.9-1.2
	Sunflower beetle	0.4-0.9

**NOTE:**

(a) Pre-harvest interval (days) given in brackets after crop.

(b) Rate range - use the higher rate for severe infestation, adult insects, or dense foliage.

**Water Volume:** Ground equipment - 45 L/ac; aircraft application - 9 L/ac or 4.5-9.0 L/ac for potatoes.

5. APPLICATION TIPS: Apply to alfalfa when insects or damage first appears or when 20-30% of stems have tip damage by alfalfa weevil. Repeat application as necessary or, for potatoes, at 7 day intervals (exception flea beetles and Colorado potato beetles at 10-15 day intervals). Thorough coverage of foliage is essential. Do not apply when rain is imminent.
6. GRAZING RESTRICTIONS: Do not harvest alfalfa for feed or hay or allow livestock to graze within 10 days of application. Do not feed or allow livestock to graze on treated canola, mustard or sunflower.
7. TOXICITY: Acute oral LD<sub>50</sub> rats (mg/kg) = (65). Toxic to bees.
8. PRECAUTIONS, FIRST AID: Do not get in eyes, on skin or clothing. Wear goggles or face shield and rubber gloves when mixing. Do not inhale spray mist. Wear a respirator during prolonged use. Do not re-enter the treated field on day of application. Do not apply to crops in bloom. A minimum 3 day re-entry period for foraging bees is necessary. **Typical organophosphate poisoning symptoms may include:** headache, dizziness, blurred vision, weakness, nausea, cramps, diarrhea, discomfort in chest, sweating, salivation, pulmonary edema, cyanosis, uncontrollable muscle twitches, loss of reflexes, convulsions, coma. **First Aid:** Atropine is antidotal. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). Get medical attention for eyes. IF SWALLOWED - induce vomiting (see page 3). Get medical attention.
9. STORAGE: Store at temperatures above 0°C. Do not use or store near heat or open flame.



1. FORMULATION: Granular - Temik 10G (10% aldicarb)
2. REGISTERED MIXES: Compatible with most fertilizers and pesticides. Do not use with alkaline materials such as lime.
3. HOW IT WORKS: Aldicarb is a soil-applied, systemic, carbamate insecticide. Soil moisture is required to release the active chemical from the granules (corn cob grits) so irrigation or rainfall should follow application. Uptake by roots is rapid; residual activity varies with dosage and pests involved but often lasts more than 6 weeks.
4. NUMBER OF APPLICATIONS: One application per year for field crops.
5. HOW TO APPLY:  
With: Ground equipment.  
Rate:  

Crop	Insect	kg/ac	g/100 m row
Potato	Flea beetles, Colorado potato beetle, leafhoppers	9.0	200
	Aphids	4.5	100
Sugar beet	Sugar beet root maggot	4.5	100
6. INCORPORATION: **Furrow Treatment:** Apply granules with seed in the planting furrow and cover with soil. **Band Treatment:** At planting, apply granules in a 20 cm wide band and work into the soil or cover with soil to a depth of 10 cm. Plant seed pieces in the treated zone. **Side Dressing:** At post-emergence, drill granules at a depth of 8-20 cm (usually 2.5-5 cm below the seed pieces) on both sides of the row, 5-10 cm from the row.
7. APPLICATION TIPS: Do not apply to very dry soil unless treatment is followed by irrigation. Calibrate and adjust application equipment to insure proper rate and accurate placement.
8. RESTRICTIONS: Do not harvest potatoes or sugar beets within 90 days of application. Do not harvest sugar beet tops for livestock feed within 120 days of application. Do not use tops from treated beets as food for humans. Do not use plant parts for food or feed. Do not plant food crops in soil treated with this product for at least 1 year after treatment.
9. TOXICITY: Acute oral LD<sub>50</sub> rats (mg/kg) = (0.6).
10. PRECAUTIONS, FIRST AID: Wear protective, long-sleeved clothing, goggles, pesticide respirator, and rubber gloves when handling. After work, wash entire body with soap and water. Wash contaminated clothing and protective equipment in a strong solution of washing soda and rinse thoroughly before wearing again. Avoid any contact with the product. Deep disc spills at row ends immediately to prevent birds from feeding on exposed granules. Do not mix granules directly with water. Do not use applicators that would grind granules. Do not apply to crops in open bloom. **Symptoms of poisoning:** weakness, headache, sweating, nausea, vomiting, diarrhea, tightness in chest, blurred vision, pinpoint pupils, abnormal flow of saliva, abdominal cramps, unconsciousness.
11. FIRST AID: CONTACT A PHYSICIAN IMMEDIATELY IN ALL CASES OF SUSPECTED POISONING. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Give water, repeat until vomit fluid is clear. Start artificial respiration if victim stops breathing. Get to a physician or hospital immediately. IN EMERGENCY, telephone collect 24 hours a day 1-(514)645-5311.
12. STORAGE: Do not refrigerate.
13. DECONTAMINATION AND DISPOSAL: **Spills on Floors:** If spills occur on floor areas, use a sweeping compound to clean up. Decontaminate the waste with a solution of caustic soda, a strong commercial bleach and detergent. Wash floor with the decontamination solution and rinse well with clean water. Clean up the solution and rinse water with absorbent material such as sawdust, sweeping compound or rags. Dispose of waste and rinsings by burying in a non-crop, non-graze area away from all water supplies. **Spills on Ground:** If spills occur on the ground, collect the material and dispose of it as described. Treat the affected area with the decontamination solution and cover with clean soil. **Decontamination Solution:** Into 10 L of water, slowly and carefully add in sequence 130 g detergent, followed by 525 g caustic soda (lye) and finally 1.2 L of commercial bleach (sodium hypochlorite). Handle and use the solution with great care. Do NOT add water to dry lye. **Disposal:** Dispose of empty containers by delivering them to an approved landfill site for burial.

THIMET (phorate)  
Cyanamid



1. FORMULATION: Granules - Thimet 15-G (15% phorate).
2. MARKETING CATEGORY: Restricted (products to be stored or displayed apart from food or feed).
3. HOW IT WORKS: Phorate is a systemic, organophosphorus insecticide with effective initial residual activity against soil insects and other arthropods.
4. NUMBER OF APPLICATIONS: One application at planting time.
5. HOW TO APPLY:  
**With:** Granular pesticide applicator.  
**Rate:**

Crop	Insect	g/100 m row
Potatoes	Aphids, leafhoppers, leafminers, psyllids, and reduction of potato flea beetle and wireworm damage, Colorado potato beetle (early season control).	140 (sandy or light soils) 215 (silty or heavy soils)

**PROTECTIVE EQUIPMENT:** Protective clothing, dust mask and rubber gloves while handling product.
6. APPLICATION TIPS: Distribute evenly in furrows or band on each side of the row at planting time only. Do not use in muck soils. Do not apply to any area not specified on the label.
7. TOXICITY: Acute oral LD<sub>50</sub> rats (mg/kg) = (29). Acute dermal LD<sub>50</sub> rabbits (mg/kg) = (226). Highly toxic to fish, birds, and other animals. Poisonous by skin contact, inhalation or swallowing. Repeated inhalation or skin contact may, without symptoms, progressively increase susceptibility to poisoning.
8. PRECAUTIONS, FIRST AID: Keep all unprotected persons out of the operating areas. Wear freshly laundered, long-sleeved work clothing daily. Wear dust mask, clean cap and rubber gloves (with cuffs over glove ends). Do NOT handle with bare hands. Pour downwind and allow as little free fall as possible. DO NOT BREATH DUST. Clothing and gloves should be washed with soap and water after each use. Do NOT use the same gloves for other work. Destroy and replace gloves frequently. Do NOT get in eyes, on skin, or clothing. Wash thoroughly before eating, drinking and smoking. Bathe and change outer clothing after each work day. **KEEP OUT OF REACH OF CHILDREN AND ANIMALS.** **Symptoms of poisoning:** weakness, headache, tightness of chest, blurred vision, nonreactive pinpoint pupils, salivation, sweating, nausea, vomiting, diarrhea and abdominal cramps.  
**First Aid:** Call a physician at once in case of suspected poisoning. IN EMERGENCY endangering life or property call collect day or night 613-996-6666. Atropine is an antidote. IF INHALED - remove to fresh air. If not breathing give artificial respiration, preferably mouth to mouth. If breathing is difficult, give oxygen. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). Remove contaminated clothing and shoes. IF SWALLOWED - induce vomiting (see page 3).  
**FOR PHYSICIAN:** Give atropine intramuscularly or intravenously depending on severity of poisoning, 2-4 mg every 10 minutes until fully atropinized. 20-30 mg, or more may be required during the first 24 hours. Never give opiates or phenothiazine tranquilizers or other depressants. Clear chest by postural drainage. Artificial respiration or oxygen administration may be necessary. Observe patient continuously for at least 48 hours. Repeated exposure to cholinesterase inhibitors may, without warning, cause increasing susceptibility to very small doses of any cholinesterase inhibitor. Allow no further exposure to any cholinesterase inhibitor until cholinesterase regeneration has taken place. Pralidoxime chloride (2-PAM: Protopam chloride) may be effective as an adjunct to atropine. Use according to label directions.
9. STORAGE: Not for use or storage in or around the home. Must be stored or displayed AWAY from food and feed. Store open bags in labelled sealed drums or heavy plastic bags.
10. DECONTAMINATION AND DISPOSAL: **Procedure for decontamination of surfaces:** Keep unprotected persons out of the contaminated area. **Protective Equipment:** Hat, overalls, rubber apron, rubber boots and rubber gloves. DO NOT ALLOW product to contact eyes and skin. Launder clothing and clean protective equipment after use. **WARNING:** AVOID smoking, open flames and sparks in the operating area as the decontamination procedure involves use of alcohols.  
(a) Cover spilled granules with an absorbent material such as sweeping compound to minimize dust. Sweep up granules and place in a tightly closed labelled container. Store in a secure place. Contact Cyanamid Canada Inc. or federal authorities for details on how to detoxify product. Granules that remain in a broken bag should be transferred to a clearly marked, tightly closed alternate container. Dispose of material in accordance with provincial requirements.  
(b) Wash surface with a bleach decontamination solution prepared by mixing 9 L water with 1 L commercial bleach and 0.5 L rubbing alcohol. Rinse with clean water. Clean up the liquid with absorbent material such as sawdust, sweeping compound or other materials. Repeat washing with bleach solution and water until liquid is cleaned up.  
(c) Dispose of contaminated absorbent material in accordance with provincial requirements.  
(d) Wash disposal equipment with bleach solution and rinse with clean water.  
(e) If spill occurs on the ground, collect material and dispose as directed. Treat affected area with the decontamination solution and cover with clean soil. **Disposal:** Do not contaminate any body of water, food or feed. Dispose of all empty and broken bags in accordance with provincial requirements but DO NOT BURN. Dispose of empty alternate containers likewise.

## THIODAN (endosulfan)

Hoechst



1. FORMULATIONS: Emulsifiable concentrate (400 g endosulfan/L). Wettable powder (50% endosulfan by weight)
2. REGISTERED MIXES: Endosulfan is compatible with most insecticides and fungicides except Bordeaux mixture, hydrated lime, calcium arsenate or zinc sulfate.
3. HOW IT WORKS: Endosulfan is a non-systemic, organochloride insecticide/acaricide with both contact and stomach action.
4. NUMBER OF APPLICATIONS: Repeat as necessary except for corn (sweet and field - not more than twice per season) and sugar beet (not more than once).
5. HOW TO APPLY:

With: Ground or aircraft equipment.

Rates:

Crop	Insect	Formulation	Qty/ac
Alfalfa (30), clover (30)	Spittle bugs	EC	0.3 L
Alfalfa seed	Aphids	EC	0.6 L
	Lygus bugs		1.8-2.2 L
Corn (50)	Corn leaf aphid	EC or WP	1.1 L 0.9 kg
	Corn earworm	EC or WP	1.1-1.7 L 0.9-1.3 kg
Potato (0)	Aphids, Colorado potato beetle, flea beetles, leafhoppers, tuber flea beetles	EC or WP	0.6 L 0.4 kg
Sugar beets (45)	Green peach aphid	EC	0.6 L
	Beet webworm	EC	1.1 L

NOTE:

(a) Pre-harvest or pre-grazing intervals (days) given in brackets after crop.

(b) Rate range - use the lower rate for young insects (larvae), light infestations or sparse foliage.

Water Volume: Thorough wetting of all plant parts is essential for good results.

6. APPLICATION TIPS: Keep agitator running during filling and spraying. **Mixing WP:** fill spray tank nearly full and either pour recommended amount on water surface or pre-mix powder in a bucket 1/2 filled with water then pour mix through screen into nearly filled spray tank. Finish filling tank. Spray upper and lower leaf surfaces.
7. GRAZING RESTRICTIONS: Do not feed treated crop refuse (vines, tops, stocks or threshings) or sugar beet foliage to livestock. Sugar beet roots may be fed. Do not ensile treated corn. Do not graze treated green crops except for alfalfa and clover which should not be foraged within 30 days of application. **Succeeding crops:** Do not apply to crops which are to be followed by a root crop other than carrots, potatoes, sweet potatoes or sugar beets.
8. TOXICITY: Acute oral LD<sub>50</sub> rats (mg/kg) = (80-110). Toxic to bees.
9. PRECAUTIONS, FIRST AID: Wear goggles, respirator, coveralls, and synthetic rubber gloves when mixing or loading or when spray mist cannot be avoided. Apply during late evening. Change clothing daily and wash before reuse. **Symptoms of poisoning:** nausea, headache, general feeling of being unwell, followed by generalized convulsion. **First Aid:** IF IN EYES or ON SKIN - use standard first aid measures (see page 3). Get medical attention for eyes immediately. IF WETTABLE POWDER IS SWALLOWED - induce vomiting (see page 3). Repeat until vomit is clear. Get immediate medical attention. IF EMULSIFIABLE CONCENTRATE IS SWALLOWED - do NOT induce vomiting and avoid breathing vomitus into the lungs should vomiting occur. Get immediate medical attention.
10. STORAGE: Do not store E.C. below -7°C.
11. DECONTAMINATION AND DISPOSAL: For spilled powder, spread with sawdust or dirt to prevent scattering. Apply sodium carbonate, caustic soda or hydrated lime on contaminated area. After 1 hour collect with a shovel or a broom and wash paved areas with water. For spilled liquid, decontaminate with any of above alkaline chemicals and allow to stand for 1 hour. Apply sawdust, talc, or sand to absorb all liquid. Decontaminate tools with hydrated lime. Bury unusable or clean-up product 50 cm deep in an isolated area away from any water supply. Powder removed from the site without decontamination must be decontaminated while being buried by alternating layers of caustic soda or lime with endosulfan powder. When burying with clean-up absorbents from liquid spills, apply a layer of soda, caustic or lime on the top before filling the hole.

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## CHEMICAL CONTROL OF PLANT DISEASES IN ALBERTA

### Introduction

Plants, like other living organisms, are attacked by many diseases that are caused by fungi, bacteria, viruses, mycoplasmas and nematodes. The management of plant diseases is based on 4 general parameters that include:

- Exclusion** or quarantine, i.e. prevention of a disease organism or diseased plant material from entering a country or disease-free area where the disease could become established;
- Protection** whereby proper sanitation practices, chemical controls, adequate soil nutrient levels and good soil drainage may be used to protect plants from disease organisms;
- Eradication** involving the use of crop rotations or the application of eradicant chemicals such as fungicides; and
- Plant breeding** whereby crop plants are selected for partial or complete resistance to a specific disease or range of infectious diseases.

In Alberta, fungal diseases of some field crops may be subject to direct chemical control by fungicides. Control of most other diseases rely on alternate methods. The major use of fungicides in these crops at present is in the treatment of seeds (cereal, forage, oilseed) and potato seed pieces. Except for canola and field beans, foliar fungicides are not generally registered, available or economically feasible at the present time. For convenience, dual purpose treatments with the insecticide Lindane, used in seed-treatment formulations, have been included in this chapter on fungicides.

The principles and procedures involving the use of plant disease control chemicals follow the guidelines outlined for chemical weed control in the first chapter of this manual.

**AGROX (mancozeb)**

Chipman

1. FORMULATION: Dust - Agrox Potato Seed Piece Dust (mancozeb 16%).
2. HOW IT WORKS: Mancozeb is a protective, seed-treatment fungicide that controls fusarium decay. A contact fungicide.
3. NUMBER OF APPLICATIONS: Once, at time of planting.
4. HOW TO APPLY:

With: Potato seed duster

**Rate:**

Crop

Potato

**Disease**

fusarium decay

**g/100 kg seed**

500

5. TOXICITY: Acute oral LD<sub>50</sub> rats (mg/kg) = mancozeb (12,000). Prolonged exposure may cause eye, nose, throat and skin irritation.
6. PRECAUTIONS, FIRST AID: When treating or handling treated seed, work in a well ventilated area, and wear a suitable dust mask, goggles and gloves. Treated seed should be labelled "**POISONOUS TO MAN AND ANIMALS. This seed has been treated with mancozeb for the control of fusarium decay. Do not use for food or feed purposes.**" Avoid contact with skin, eyes and clothing. Wash thoroughly after handling and before eating, drinking and smoking.  
**First Aid:** IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Get medical attention.
7. DECONTAMINATION AND DISPOSAL: Dispose of empty containers by burning or burying with municipal waste according to municipal regulations.

**BENLATE (benomyl)**

Dupont

1. FORMULATIONS: 50% Wettable Powder
2. REGISTERED MIXES: With fungicides, captan and thiram. Dual purpose formulations with insecticide, lindane. Do not mix with alkaline pesticides such as basic copper sulphate, Bordeaux mixture or lime sulphur.
3. HOW IT WORKS: Benomyl is a protective systemic fungicide.
4. NUMBER OF APPLICATIONS: One per season.
5. HOW TO APPLY:  
**With:** Ground or aircraft equipment.  
**Rate:**

Crop	Disease	g/ac
Beans, (dry, white, snap, common) (14)	<i>Sclerotinia</i> (white mould), <i>Botrytis</i> (gray mould)	710-910
Canola	<i>Sclerotinia</i> (stem rot)	400-600

  
**NOTE:**  
(a) Pre-harvest interval (days) given in brackets after crop.  
(b) Rate range - use the high rate under severe disease conditions.  
**Water Volume:** Beans - 100 L water/500 g product. Canola - minimum 16 L water/ac (air); 40 L/ac (ground).
6. APPLICATION TIPS: Beans - apply between 50 and 100% bloom; thorough coverage. Canola - apply between 20 and 30% bloom; ensure thorough coverage. Continuous agitation is required to keep the material in suspension. Do not apply when rain is imminent; do not irrigate within 6 hours of application.
7. GRAZING RESTRICTIONS: Do not graze or feed treated bean hay to livestock.
8. TOXICITY: Acute oral LD<sub>50</sub> rats (mg/kg) is greater than (10,000). May irritate eyes, nose, throat and skin. Toxic to fish.
9. PRECAUTIONS, FIRST AID: Do not apply when weather conditions favor drift from treated areas. KEEP OUT OF REACH OF CHILDREN. Avoid breathing dust or spray mist. Avoid contact with skin, eyes, and clothing. Keep away from fire or sparks.  
**First Aid:** IF IN EYES or ON SKIN - use standard first aid measures (see page 3). Get medical attention for the eyes.
10. STORAGE: Never allow product to become wet during storage as reduced fungicidal effectiveness may result. Keep container closed when not in use.
11. DECONTAMINATION AND DISPOSAL: Do not contaminate water sources, lakes, streams or ponds by cleaning of equipment or disposal of wastes. Do not reuse container; burn when empty.

**CARBATHIIN**

Uniroyal

**1. FORMULATIONS: Vitavax Seed Treatment. Solutions - 230 g/L****2. REGISTERED MIXES:*****With fungicides***

Vitavax powder (carbathiin 26.7 : thiram 38.8)

Pro-gro (carbathiin 30 : thiram 50)

***Dual purpose formulations (with insecticide)***

Vitavax rs flowable (carbathiin 45 g/L : thiram 90 g/L : lindane 680 g/L)

Vitavax rs powder (carbathiin 3.3 : thiram 6.7 : lindane 50.0)

Vitavax Dual powder (carbathiin 20.0 : thiram 28.9 : lindane 18.7)

Vitavax Dual solution (carbathiin 180 g/L : lindane 165 g/L)

**3. HOW IT WORKS: Carbathiin a systemic fungicide, penetrates the seed coat to control disease.****4. NUMBER OF APPLICATIONS: Seed treatment - one.****5. HOW TO APPLY:**

**With:** On-farm treatment - through the auger with special equipment or with an inexpensive pump or driplator device; or at seed cleaning plant.

**Rate:**

Crop	Disease	mL/25 kg seed
		230 g/L Solution
Barley	Smuts (covered, false loose, true)	60-75*
Flax	Seedling blight, damping-off, seed decay	100
Oats	Smuts (loose, covered)	60
Rye	Stem smut	60
Wheat	Smuts (true loose, stinking bunt)	60-75*

**\*NOTE:**

For wheat and barley varieties highly susceptible to true loose smut and for high levels of smut or bunt on seed, the 75 mL rate will give increased disease control. Vitavax Single solution will generally increase emergence and plant stands by reducing seed-borne seed rots and seedling blights. This beneficial effect will allow treated seed to give increased yields for crops growing under stress conditions such as disease, cool weather and drought.

**6. GRAZING RESTRICTIONS: Treated seed not to be used as feed. Do not graze or feed livestock on treated areas for 4 weeks after planting.****7. TOXICITY: Acute oral LD<sub>50</sub> rats (mg/kg) = carbathiin (3,280).****8. PRECAUTIONS, FIRST AID: Read the label before using any product. Work in a well ventilated area. When treating seed, augering or handling treated seed, wear a dust mask, goggles and gloves. Avoid breathing vapours. Treated seed is easily recognized by its prominent red color. KEEP OUT OF REACH OF CHILDREN. Do not get in eyes or on skin.**

**First Aid:** IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - Do NOT induce vomiting. Get medical attention immediately.

**9. STORAGE: Store above 0°C. Do not store in or around the home.****10. DECONTAMINATION AND DISPOSAL: Do not contaminate lakes, ponds or streams. Puncture and crush empty container, bury 50 cm deep away from any source of water, or take to designated disposal area.**

**CARBATHIIN : THIRAM**  
**Uniroyal**

1. FORMULATIONS: Dust - Vitavax Powder (carbathiin 26.7% : thiram 38.8%).

2. REGISTERED MIXES:

**With the insecticide** - lindane (% carbathiin : % thiram : % lindane)

Vitavax Dual Powder (20.0 : 28.9 : 18.7)

Vitavax rs Flowable (45 g/L, 90 g/L, 680 g/L)

Vitavax rs Powder (3.3 : 6.7 : 50.0).

3. HOW IT WORKS: Thiram is a fungicide which controls diseases carried on the seed. Carbathiin is a systemic fungicide which penetrates the seed coat to control diseases inside the seed and seedling.

4. NUMBER OF APPLICATIONS: Seed treatment - one.

5. HOW TO APPLY: Dust - Do NOT mix with bare hands. When starting with an empty drill or planter box, separately treat enough seed to cover the bottom of the box.

Fill the drill or planter box to 1/2 capacity and sprinkle 1/2 the required amount of powder over the seed. Mix thoroughly with a paddle until the seed is uniformly covered. Seed should all be pink. Then add enough seed to fill the box, cover with the remaining powder and repeat mixing procedure. For large drill or planter boxes, it may be necessary to divide the seed into several portions. Clean planter plates periodically to prevent excessive build-up of treatment chemicals.

**Rate:**

<b>Crop</b>	<b>Disease</b>	<b>g powder/25 kg seed</b>
Barley	Smuts (false loose, true loose, covered)	50
Flax	Seedling blight, damping-off, seed decay	60
Oats	Smuts (loose, covered)	70
Rye	Damping-off, seed decay, stem smut	45
Wheat	Smuts (loose, stinking), bunt	55

6. GRAZING RESTRICTIONS: Do not use treated seed for feed, food or oil processing. Do not graze or feed livestock on treated areas for 4 weeks after planting.

7. TOXICITY: Acute oral LD<sub>50</sub> rats (mg/kg) = carbathiin : thiram (1,600).

8. PRECAUTIONS, FIRST AID: Read the label before using any product. Work in well ventilated area and wear a dust mask, goggles and gloves. **KEEP OUT OF REACH OF CHILDREN.** **Symptoms of poisoning:** skin contact may result in irritation and dermatitis. Consumption of alcohol within 24 hours of working with thiram may cause flushing, sweating, headache and nausea.

**First aid:** IF IN EYES - flush immediately with running water. Seek medical attention. IF ON SKIN - wash with warm water and pumice soap to remove dye. IF SWALLOWED - induce vomiting (see page 3). Keep patient quiet. Seek medical attention immediately.

9. STORAGE: Do not store product in or around the home or near food or feed. Store powder in a dry area. Do not store suspension in direct sunlight or at temperatures above 35°C. Suspension will not freeze even in normal winter temperatures. Do not store seed treated with powder.

10. DECONTAMINATION AND DISPOSAL: Do not contaminate any water supply, food or feed.

DUAL PURPOSE FORMULATIONS  
BENOMYL : CAPTAN : LINDANE

Chipman



1. FORMULATIONS: Dust - Gammasan + (6% : 10% : 50%). Suspension - Gammasan F (2.7% : 4.5% : 22.6%)
2. HOW IT WORKS: Benomyl systemic fungicide protects against blackleg. Captan fungicide protects young plants against rots and damping-off. Lindane organochlorine insecticide which acts by ingestion, contact and, to a lesser extent, by fumigant action against many soil-dwelling insects.
3. HOW TO APPLY: **Pre-seeding Treatment:** preferred method of application. Treat seed in an end-over-end drum-type seed treater or a cement mixer. **Drill Box Treatment:** (follow directions carefully - misapplication may result in drill plugging). When starting with an empty planter box, treat enough seed in a separate container to cover bottom of planter box. Mix powder and seed thoroughly until seed is a uniform color by either of the following methods.  
**Alternate Mixing Methods:**  
(a) Place and level 1/2 of the seed in drill or planter box and sprinkle uniformly over surface, 1/2 the powder required for the full planter box. Mix thoroughly with a paddle, then fill the box with seed and sprinkle the remaining 1/2 of the powder over the seed and mix again until seed is a uniform color. Do NOT mix with bare hands.  
(b) Dribble 775 g of powder into each 25 kg of seed as it is poured into the drill box. Thoroughly mix with a lath or paddle when the drill box is 1/2 full and again when full until seed is a uniform color.

**Rate:**

Crop	Disease and Insect	Qty/25 kg seed
Canola	Blackleg, seedling blight, flea beetles	750-1550 g 1250 mL

**NOTE:**

- (i) Use the higher rate in areas of heavy flea beetle infestation (generally only produced by successive cropping of flea beetle-susceptible crops on the same or immediately adjacent areas).
- (ii) Provides flea beetle protection during germination and early emergence only.
- (iii) For high rate, use 150 mL mineral oil or linseed oil as a sticker per 25 kg seed. Churn or mix the seed and oil then add powder and mix again. High rate should be used only with planting equipment that can be adjusted to compensate for the increased coating on the seed.

4. TOXICITY: Acute oral LD<sub>50</sub> rats (mg/kg) = benomyl (710,000), captan (9,000), lindane (88-125). Lindane is toxic to fish, birds, and other animals. Poisonous if swallowed, inhaled or absorbed through the skin.
5. PRECAUTIONS, FIRST AID: Oil-dressed seed should be sown within 1 week of treating to avoid shedding of treatment. Wash thoroughly after handling or using and before eating or smoking. Consumption of alcohol 24 hours before or after working with thiram may cause sweating, flushing and nausea. KEEP OUT OF REACH OF CHILDREN. **Symptoms of poisoning:** Lindane - nausea, vomiting, hyperirritability, convulsions, coma. Skin contact with fungicides may result in irritation and dermatitis.  
**First aid:** IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Give epsom salts as a laxative. Avoid mineral oils and castor oil. Get medical attention.
6. STORAGE: Do not store in the home or near food or feed. NEVER allow product to become wet during storage (this may lead to chemical changes which will reduce the effectiveness of the benomyl fungicide). Keep container closed when not in use. Dry treated seed may be stored for several months.
7. DECONTAMINATION AND DISPOSAL: Wash contaminated clothing before re-use. Do not contaminate bodies of water, food or feed. Bury empty containers.

**DUAL PURPOSE FORMULATIONS**  
**BENOMYL : THIRAM : LINDANE**  
**Federated Co-operatives**  
**May and Baker**



1. FORMULATIONS: Dusts - Benolin R (6% : 10% : 50%). - Thiralin Plus (6% : 10% : 75%)
2. HOW IT WORKS: Benomyl is a systemic fungicide that protects against blackleg. Thiram fungicide protects against seed-borne diseases. Lindane, an organochlorine insecticide that acts by ingestion, contact and, to a lesser extent, by fumigant action against many soil-dwelling insects.
3. HOW TO APPLY: Seed to be treated with Benolin R may be treated first with canola or vegetable oil (135 mL/100 kg seed) to improve contact between seed and product. Thiralin Plus has an added adhesive. Clean planter plates periodically to prevent excessive build-up of chemicals. Do NOT mix with bare hands. Under certain circumstances, for example, if excessive oil is added, the seed may bridge in the seed drill. Check the seed drill calibration before and during seeding operation.

**Alternative Mixing Methods**

(a) When starting with an empty planter box, first cover the planter box bottom with treated seed (mixed in a separate container) to ensure that first seeds sown are adequately treated. Then fill 1/2 the drill or planter box and sprinkle the required amount of powder over the seed. Mix with a paddle until the seed is a uniform color. Add enough seed to fill the box, cover with the required amount of powder and mix again. For large boxes, it may be necessary to divide the seed into several portions.

(b) Use a commercial drum or auger, dust seed-treater or a cement mixer.

**Rate:**

Crop	Disease and Insect	Formulation	g/25 kg seed
Canola	Blackleg, damping-off, seedling decay, seedling blight, flea beetles	Thiralin Plus	750
		Benolin R	800

4. GRAZING AND CROPPING RESTRICTIONS: Do not use on soil in which edible root crops (except rutabagas and turnips) are to be planted in the same or following season.

5. TOXICITY: Acute oral LD<sub>50</sub> rats (mg/kg) = benomyl (710,000), thiram (375), lindane (88-125), Thiralin-Plus (40-200). Lindane is toxic to fish, birds, and other animals. Poisonous if swallowed, inhaled or absorbed through the skin.

6. PRECAUTIONS, FIRST AID: Oil-dressed seed should be sown within 1 week of treating to avoid shedding of treatment. Wash thoroughly after handling or using and before eating or smoking. Consumption of alcohol 24 hours before or after working with thiram may cause sweating, flushing and nausea. **KEEP OUT OF REACH OF CHILDREN.** **Symptoms of poisoning:** Lindane - nausea, vomiting, hyperirritability, convulsions, coma. Skin contact with fungicides may result in irritation and dermatitis.

**First aid:** IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Give epsom salts as a laxative. Avoid mineral oils and castor oil. Get medical attention.

7. STORAGE: Do not store in the home or near food or feed. NEVER allow product to become wet during storage (this may lead to chemical changes which will reduce effectiveness of the benomyl fungicide). Keep container closed when not in use. Dry, treated seed may be stored for several months.

8. DECONTAMINATION AND DISPOSAL: Wash contaminated clothing before re-use. Do not contaminate bodies of water, food or feed. Bury empty containers.

**DUAL PURPOSE FORMULATIONS**  
**CARBATHIIN : THIRAM : LINDANE**  
Uniroyal



**1. FORMULATIONS: (carbathiin : thiram : lindane)**

Suspension - Vitavax rs Flowable (45 g/L, 90 g/L, 680 g/L)

Dusts - (1) Vitavax rs Powder (3.3% : 6.7% : 50.0%)

- (2) Vitavax Dual Powder (20.0% : 28.9% : 18.7%)

Solution - Vitavax Dual Solution (carbathiin 180 g/L : lindane 165 g/L).

**2. HOW IT WORKS:** Lindane is an organochlorine insecticide which acts by ingestion, contact and, to a lesser extent, by fumigant action against many soil-dwelling and phytophagous insects. Thiram is a fungicide which controls seed-borne diseases. Carbathiin is a systemic fungicide which penetrates the seed coat to control diseases of the seed and seedling.

**3. NUMBER OF APPLICATIONS:** Seed treatment - once at time of planting.

**4. HOW TO APPLY:** *Flowable* can be applied either in a continuous treating operation with S-Series Treaters or OFT Treaters (available from Uniroyal Chemical) or with batch treaters or cement mixers.

Fill drill box to 1/2 capacity and sprinkle required amount of powder over seed. Mix with a paddle until seed is an uniform color. Add seed to fill the box, cover with remaining powder and repeat. For large drill boxes, divide the seed into several portions. Clean planter plates periodically to prevent excessive build-up of chemicals.

*Solution* can be applied on the farm using an auger with a pump or driplator device or custom application is available at seed cleaning plants.

**With:** Seed-dressing equipment.

**Rate:**

Crop	Disease and Insect	g powder	mL/25 kg seed
Barley	Smuts (covered, false loose, true loose), wireworms	70(2)	75-90* (solution)
Canola, Mustard	Seedling blight, damping-off, seed decay, blackleg, flea beetles	750(1)	562 (suspension)
Flax	Seedling blight, damping-off, seed decay	70(2)	
Oats	Smuts (covered, loose), wireworms	95(2)	75 (solution)
Rye	Stem smut, damping-off, seed decay, wireworms	60(2)	
Wheat	Smuts (loose, stinking), bunt, wireworms	65(2)	75-90* (solution)

**\*NOTE:**

For wheat and barley varieties highly susceptible to true loose smut and for high levels of smut or bunt on seed, the 90 mL rate will give increased disease control. Vitavax Dual solution will generally increase emergence and plant stands by reducing seed-borne seed rots and seedling blights. This beneficial effect will allow treated seed to give increased yields for crops growing under stress conditions such as disease, cool weather and drought.

**5. GRAZING RESTRICTIONS:** Do not use treated seed for feed, food or oil processing. Do not graze or feed livestock on treated areas for 4 weeks after planting.

**6. TOXICITY:** Acute oral LD<sub>50</sub> rats (mg/kg) = Vitavax rs (302), Vitavax Dual Solution (1,740), carbathiin (3,820), thiram (375), lindane (88-125).

**7. PRECAUTIONS, FIRST AID:** Read the label before using any product. Work in a well ventilated area and wear a dust mask, goggles and gloves. Consumption of alcohol 24 hours before or after working with thiram may cause sweating, flushing, headache and nausea. **KEEP OUT OF REACH OF CHILDREN.** **Symptoms of poisoning:** With lindane - nausea, vomiting, hyperirritability, convulsions, coma. Skin contact with fungicides may result in irritation and dermatitis.

**First aid:** IF IN EYES - flush immediately with running water. Seek medical attention. IF ON SKIN - wash with warm water and soap. IF SWALLOWED - induce vomiting (see page 3). Keep patient quiet. Seek medical attention immediately.

**8. STORAGE:** Do not store in or around the home and store above 0°C. Seed treated with flowable should be tested for germination before planting if stored for more than 6 months. Do not store in areas where temperatures exceed 25°C. Store powder in dry area. Do not store seed treated with powder.

**9. DECONTAMINATION AND DISPOSAL:** Do not contaminate any water supply, food or feed. Leftover seed treated with powder should be double sown around the headland, or buried away from water sources.

**DUAL PURPOSE FORMULATIONS**  
**IPRODIONE : LINDANE**  
**May and Baker**



1. **FORMULATIONS:** Suspension - Rovral ST Flowable (iprodione 16.7%; lindane 50%).
2. **HOW IT WORKS:** Lindane, an organochlorine insecticide that works by ingestion, contact and to a lesser extent, by fumigant action against soil-dwelling insects. Iprodione fungicide protects against seed-borne blackleg.
3. **NUMBER OF APPLICATIONS:** Seed treatment - one.
4. **HOW TO APPLY:**  
**With:** On-farm treatment - through the auger with special equipment or with an inexpensive pump or dripolator device; or at seed cleaning plant.  
**Rate:**

Crop	Disease and Insect	mL/25 kg seed
Canola	Blackleg, flea beetles	750 (suspension)
5. **TOXICITY:** Acute oral LD<sub>50</sub> rats (mg/kg) = 200-400.
6. **PRECAUTIONS, FIRST AID:** Treat only the amount of seed required to avoid storing treated seed. **Symptoms of poisoning:** Lindane - may include nausea, vomiting, hyperirritability, convulsions, coma and other symptoms typical of organochlorine insecticide poisoning. Skin contact with fungicides may produce irritation or dermatitis.  
**First Aid:** IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Give epsom salts as a laxative. Avoid mineral oils and castor oil. Get medical attention.  
**FOR PHYSICIAN:** Lindane is an organochlorine insecticide. Barbiturates may be given to control convulsions. Oxygen may be indicated. Keep patient quiet. Avoid use of morphine and adrenaline.
7. **STORAGE:** Do not store in the home, or near food or feed. Protect from frost (freezing).
8. **DECONTAMINATION AND DISPOSAL:** Do not contaminate any water supply, food or feed.

**DUAL PURPOSE FORMULATIONS**  
**MANEB : LINDANE**  
**Federated Co-operatives**



1. FORMULATIONS: Dusts - Co-op DP, Mergamma N-M, Pool N-M Dual and Trinox (37.5% : 18.75%)  
Suspension - Mergamma F.L. - (260 g/L maneb : 130 g/L lindane)
2. HOW IT WORKS: Maneb is a protective, seed-treatment fungicide. Lindane is an organochlorine insecticide that works by ingestion, contact and, to a lesser extent, by fumigant action against many soil-dwelling insects.
3. HOW TO APPLY: Place and level 1/2 of seed in drill box and sprinkle 1/2 of required amount of product uniformly over seed. Mix thoroughly with a paddle. Fill box with seed and sprinkle on remaining powder, mix again until all streaking has disappeared and coloring of seed is uniform.

**Alternate Mixing Methods:**

- (a) Dribble the required amount of product into the seed as it is poured into the drill box. Thoroughly mix with a paddle when drill box is 1/2 full and again when full until colouring of seed is uniform.
- (b) Apply through a mechanical dispenser or proportioner that attaches to the auger that conveys seed into the drill box.
- (c) Apply with any standard dry seed-treatment application equipment.

**Rate:**

Crop	Disease and Insect	g/25 kg seed	mL/25 kg seed
Barley	Smuts (covered, false loose), seedling blight, root rot, wireworms	65 (powder)	100 mL (suspension)
Oats	Smuts, seedling blight, root rot, wireworms	92 (powder)	138 mL
Rye	Bunt, seedling blight, root rot, wireworms	56 (powder)	84 mL
Wheat	Bunt, stinking smut, seedling blight, root rot, wireworms	52 (powder)	78 mL (suspension)

4. TOXICITY: Acute oral LD<sub>50</sub> rats (mg/kg) = maneb (6,750), lindane (88-91).
5. PRECAUTIONS, FIRST AID: Treat only the amount of seed required to avoid storing treated seed. KEEP OUT OF REACH OF CHILDREN. **Symptoms of poisoning:** Lindane - may include nausea, vomiting, hyperirritability, convulsions, coma, and other symptoms typical of organochlorine insecticide poisoning. Skin contact with maneb may produce irritation or dermatitis. **First Aid:** IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Give epsom salts as a laxative. Avoid mineral oils and castor oil. Get medical attention. **FOR PHYSICIAN:** Lindane is an organochlorine insecticide. Barbiturates may be given to control convulsions. Oxygen may be indicated. Keep patient quiet. Avoid use of morphine and adrenaline.
6. STORAGE: Do not store in or around the home, or near food or feed. NEVER allow product to become wet during storage. This may lead to chemical changes which will reduce the effectiveness of fungicide. Keep container closed when not in use. Do not store treated seed more than 1 year.
7. DECONTAMINATION AND DISPOSAL: Do not contaminate any water supply, food or feed.

**FORMALDEHYDE (formalin)**  
Later's Chemicals



WARNING POISON

1. **FORMULATION:** Solution - 37% formaldehyde (formalin)
2. **HOW IT WORKS:** Formaldehyde is a bactericide and fungicide, used as a soil fumigant and seed treatment, although the latter use is limited by phytotoxicity. (1 mL solution = 1.08 g)
3. **NUMBER OF APPLICATIONS:** One.
4. **HOW TO APPLY:**  
**With:** Small sprayers or sprinklers.  
**Rate:**

Crop	Disease	g Solution/25 kg grain
Barley	Covered smut	40 (37 mL)
Oats	Smuts (covered, loose)	40 (37 mL)
Wheat	Bunt, covered smut	40 (37 mL)
Potato tubers	Common scab, black scurf, (rhizoctonia)	50 mL solution (cold) OR 100 mL solution (hot)

**Water Volume:** *Potato tubers:* cold treatment - use 50 mL/10 L water to soak uncut tubers for 2 hours; hot treatment - use 100 mL/10 L 49-52°C water to soak uncut tubers for 3-4 minutes, then cover for 1 hour. Allow tubers to dry before cutting and planting. **Grain:** use 325 g solution/100 L water.
5. **APPLICATION TIPS:** Grain - pile grain on a clean floor, sprinkle well with solution and shovel over until all grains are thoroughly wet. Cover for 4 hours (or overnight) with clean sacks or blankets moistened with solution. Sow as soon as possible, preferably while still damp. If smut balls are present, immerse grain in the solution for 5 minutes. Stir. Skim off smut balls. Drain thoroughly and cover as above.
6. **TOXICITY:** Acute oral LD<sub>50</sub> rats (mg/kg) = formaldehyde (800). May cause irritation of skin, eyes, nose, and throat.
7. **PRECAUTIONS, FIRST AID:** Use with good ventilation. A gas mask should be worn to prevent inhaling the gas fumes, and gloves to prevent skin irritation. Leave the room or building as soon as possible. Avoid prolonged or repeated contact and breathing of vapor. Keep away from heat, fire and sparks. **Symptoms of poisoning:** Skin contact may produce irritation and dermatitis. Ingestion may cause severe abdominal pain, nausea, and vomiting, sometimes followed by stupor. Exposure to vapours may cause burning and stinging of eyes and headache.  
**First Aid:** IF INHALED - remove patient to fresh air; have him lie down and keep quiet and warm. Give patient egg white and milk; obtain medical attention. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - induce vomiting (see page 3). Repeat until vomit fluid is clear. Then give a gruel of flour and water. Rush patient to nearest hospital taking the labelled container with you.
8. **STORAGE:** Do not freeze. Minimum storage temperature 15°C. Store in a dry, ventilated place, away from food and feed.
9. **DECONTAMINATION AND DISPOSAL:** Do not contaminate any body of water, food or feed. Puncture empty container and bury at least 50 cm deep and away from water supply.

**MANZATE-D, DITHANE M-22 (maneb)**  
**Federated Co-operatives**

1. FORMULATIONS: **Drill Box Seed Treatments:** Agrox N-M Wettable Powder, Co-op N-M Dust, Pool N-M Dust (50% maneb). **Foliar Spray:** Maneb 80-W Wettable Powder (80% maneb). Agrox - Suspension (300 g/L)
2. REGISTERED MIXES: With lindane as dual purpose formulations. Compatible with most insecticides and fungicides but not with Bordeaux mixture or lime.
3. HOW IT WORKS: Maneb is a fungicide, effective against many seedling and foliar diseases.
4. NUMBER OF APPLICATIONS: One for seed treatment. Repeat every 7-10 days for treatment of early and late blight on potatoes; shorten interval to 5-7 days when weather favours disease.
5. HOW TO APPLY: **Protective Equipment:** Wear a dust mask, goggles, long-sleeved shirt, rubber or PVC gloves and rubber or PVC apron when handling product. Ventilate indoor working area.

**Alternate Mixing Methods**

- (a) Place and level 1/2 of the seed in drill box and sprinkle 1/2 of the required amount of product uniformly over seed. Mix thoroughly with a paddle. Fill box with seed and sprinkle remaining powder and mix again until all streaking has disappeared and coloring of seed is uniform.
- (b) Dribble the required amount of product into seed as it is poured into drill box. Thoroughly mix with a paddle when drill box is 1/2 full and again when full until coloring of seed is uniform.
- (c) Apply through a mechanical dispenser or proportioner that attaches to the auger that conveys seed into the drill box.
- (d) Apply with any standard dry seed-treatment application equipment.

**Rate:**

Crop	Disease	g/25 kg seed	mL/25 kg seed
Barley	Smuts (covered, false loose)	50-66	45 (suspension)
Flax	Seedling blight, damping-off	112	- (not registered)
Oats	Smuts	69-92	115 (suspension)
Rye	Bunt	28-43	45 (suspension)
Wheat	Bunt or stinking smut	26-40	45 (suspension)

Potatoes - early blight - start spraying when plants are 15 cm high.

Crop	Disease	g/ac
Potato (1)*	Early blight, late blight	911
Sugar beet (14)*	Cercospora leaf spot	911

\*NOTE: Pre-harvest interval (days) given in brackets following crop.

6. TOXICITY: Acute oral LD<sub>50</sub> rats (mg/kg) = maneb (6,750).
7. PRECAUTIONS, FIRST AID: Do not apply or allow to drift to areas occupied by unprotected persons or to streams, lakes or ponds to protect wildlife. Avoid contamination of feed or food, including such crops on which residue is unsafe. Keep away from fire and sparks.  
**First Aid:** IF IN EYES or ON SKIN - use standard first aid measures (see page 3). Get medical attention for eyes. IF SWALLOWED - induce vomiting (see page 3). Repeat until vomit is clear. Take patient to nearest hospital taking the labelled container with you.
8. STORAGE: Store product in a cool, dry place away from food or feed. Prevent the contents from becoming wet as this will reduce effectiveness and may cause flammable vapours.
9. DECONTAMINATION AND DISPOSAL: Burn empty bag; stay out of smoke.

**MERTECT (thiabendazole)**

Chipman

1. FORMULATION: Suspension - Flowable (45% thiabendazole)
2. HOW IT WORKS: Thiabendazole is a fungicide which controls *Fusarium*, *Helminthosporium*, *Oospora*, *Phoma* and *Rhizoctonia* fungi.
3. NUMBER OF APPLICATIONS: One per season.
4. HOW TO APPLY:  
**With:** Spray equipment.  
**Rate:**

Crop	Disease	mL/1000 kg potatoes
Potatoes	Storage rot	90 (suspension)
5. APPLICATION TIPS: Potatoes must rotate along the conveyor line to ensure complete coverage.
6. TOXICITY: Acute oral LD<sub>50</sub> rats (mg/kg) = thiabendazole (3,300). May cause skin irritation.
7. PRECAUTIONS, FIRST AID: Consult with manufacturer before mixing with other chemicals. Wash hands, face and arms after use and before eating, drinking or smoking.  
**First aid:** IF IN EYES or ON SKIN - use standard first aid measures (see page 3). Get medical attention for eyes. IF SWALLOWED - do NOT induce vomiting, product contains petroleum distillates. Contact a physician.
8. DECONTAMINATION AND DISPOSAL: When cleaning equipment or disposing of wastes, do not contaminate any water sources. Do not reuse container - destroy when empty.

## ROVRAL (iprodione)

May and Baker

1. FORMULATIONS: Wettable Powder (50% iprodione). Flowable (250 g iprodione/L)

2. REGISTERED MIXES: With lindane as dual purpose formulation.

3. HOW IT WORKS: Rovral is a protective and eradicant fungicide.

4. NUMBER OF APPLICATIONS: Refer to label - depends on crop.

5. HOW TO APPLY:

With: Ground or aircraft equipment.

Rate:

Crop	Disease	g/ac	mL/ac
Canola	<i>Sclerotinia</i>	400-600	800-1200
Beans (white, kidney, snap)	<i>Sclerotinia</i> and <i>Botrytis</i>	400-600	800-1200

Water Volume: Canola 16 L/ac (aerial); 40 L/ac (ground). Beans 16 L/ac (aerial); 121 L/ac (ground).

6. APPLICATION TIPS: Spray mixture should be used on the day prepared. Addition of 405 g nonionic wetter is recommended for improved fungicide performance. When disease is actively growing in beans, the infection may quickly exceed the point where 5% of plants show mould. Good spray coverage is essential. Do not spray in heavy dew or when rain is imminent.

7. TOXICITY: Acute oral LD<sub>50</sub> rats (mg/kg) = iprodione (3,500).

8. PRECAUTIONS, FIRST AID: Avoid inhaling mist. A mild eye irritant. IF IN EYES or ON SKIN - use standard first aid measures (see page 3). IF SWALLOWED - if patient is conscious, wash out mouth. If breathing stops, start artificial respiration. Get medical attention.

9. STORAGE: Store flowable above 0°C.

10. DECONTAMINATION AND DISPOSAL: Do not contaminate domestic or irrigation water.

## THIRAM 75 & THIRAM 320 (thiram)

Uniroyal

1. FORMULATIONS: Wettable Powder - (75% thiram). Suspension - Flowable (32.4% thiram)

2. REGISTERED MIXES: In various combinations with other fungicides (benomyl and carbathiin) and, as dual purpose formulations, with insecticides (chlorfenvinphos, ethion, fensulfothion, fonophos and lindane).

3. HOW IT WORKS: Thiram is a protective fungicide applied as a foliar spray or a seed-treatment powder.

4. NUMBER OF APPLICATIONS: Seed treatments - one.

5. HOW TO APPLY:

With: With seed-treatment equipment.

Rate:

Crop	Disease	Qty/25 kg seed
Alfalfa	Verticillium wilt	90 g wettable powder OR 180 mL suspension
Canola, mustard, sugar beet	Seed decay, seedling blight, damping-off	100 g wettable powder
Bean (snap dry), pea, soybean	Seed decay, seedling blight, damping-off	25-35 g wettable powder
Corn (sweet)	Seed decay, seedling blight, damping-off	55 g wettable powder

6. APPLICATION TIPS: Oilseeds - mix powder and seed in drill box. Simultaneous treatment with an insecticide for control of flea beetles is recommended (see also the manual sections on carbofuran and lindane).

7. TOXICITY: Acute oral LD<sub>50</sub> rats (mg/kg) = thiram (375-865). May irritate eyes, nose, throat or skin. May cause allergic eczema in sensitive individuals.

8. PRECAUTIONS, FIRST AID: Avoid breathing dust or spray mist. When treating, augering or handling treated seed, work in a well ventilated area and wear goggles, gloves and a dust mask. Keep away from fire or sparks. Wash thoroughly after handling and before eating, drinking or smoking. Consumption of alcohol 24 hours before and after working with thiram or thiram-treated seed may cause sweating, flushing and nausea.

*First Aid:* IF IN EYES or ON SKIN - use standard first aid measures (see page 3). Get medical attention for eyes.

9. STORAGE: Store in a cool, dry, ventilated place away from food or feed.

10. DECONTAMINATION AND DISPOSAL: Wash contaminated clothing with soap and hot water before wearing.



AIL	KNAWEL	KOCHIA	LAMB'S-QUARTERS	MUSTARDS, RAPESEED (Volunteer)	OATS (Wild, Volunteer)	PIGWEED (Prostrate)	PIGWEED (Redroot)	RADISH (Wild)	RAGWEED	SHEPHERD'S PURSE	SMARTWEED (Lady's-Thumb)	SOW-THISTLES (Annual and Perennial)	SPURGE (Leafy)	SPURRY (Corn)	STINKWEED	STORK'S-BILL	THISTLE (Canada)	THISTLE (Russian)	TOADFLAX	VOLUNTEER CEREALS
	Buctril M Hoe-Grass II Pardner Sabre Torch DS	Afolan & MCPA Blagai Bromox 720 Buctril M 2,4-D Dyvel Estaprop Glean Hoe-Grass II Lorox & MCPA MCPA Pardner Phenoxyline Plus Sabre Stampede CM Target Torch DS	Afolan & MCPA Blagai Bromox 720 Buctril M Cobutox 400 2,4-D Butyric 400 Dyvel Embutox E Estaprop Glean Hoe-Grass II Kil-Mor Lexone & Mixes Lorox & MCPA MCPA Pardner Phenoxyline Plus Sabre Sencor & Mixes Stampede CM Target Torch DS Tordon 202C Tropotox Plus	Afolan BW Avenge 200C Carbyne 2EC Hoe-Grass 284	2,4-D Dyvel Kil-Mor Lorox & MCPA MCPA Target	Afolan & MCPA Blagai 2,4-D Dyvel Kil-Mor Lorox & MCPA MCPA Target	Afolan & MCPA Blagai* Bromox 720 Buctril M Cobutox 400 2,4-D Butyric 400 Dyvel Embutox E Estaprop Glean Hoe-Grass II Kil-Mor Lexone & Mixes Lorox & MCPA MCPA Pardner Phenoxyline Plus Target Tropotox Plus	Afolan & MCPA Blagai* Bromox 720 Buctril M Cobutox 400 2,4-D Butyric 400 Dyvel Embutox E Estaprop Glean Hoe-Grass II Kil-Mor Lexone & Mixes Lorox & MCPA MCPA Pardner Phenoxyline Plus Target Tropotox Plus	Afolan & MCPA Blagai* Bromox 720 Buctril M Cobutox 400 2,4-D Butyric 400 Dyvel Embutox E Estaprop Glean Hoe-Grass II Kil-Mor Lexone & Mixes Lorox & MCPA MCPA Pardner Phenoxyline Plus Target Tropotox Plus	Afolan & MCPA (P-seedlings) Banvel* (P) Blagai* Bromox 720* (P) Buctril M* (P)	2,4-D* Dyvel* Embutox E* Estaprop* Glean* Kil-Mor* (A) Lorox & MCPA (A) MCPA* Lexone & Mixes Lorox & MCPA MCPA* Phenoxyline Plus (A) Sabre* (P) Target (A) Tordon 202C* Tropotox Plus (A)	Banvel** 2,4-D* MCPA*	Afolan & MCPA Banvel Blagai Dyvel Kil-Mor Lexone & Mixes Lorox & MCPA Mecoturf Sencor & Mixes Target	Afolan & MCPA Banvel Blagai Dyvel Kil-Mor Lexone & Mixes Lorox & MCPA Mecoturf Sencor (mixes) Target	Afolan & MCPA Banvel Blagai Dyvel Kil-Mor Lexone & Mixes Lorox & MCPA Mecoturf Sabre* Sencor (mixes) Target	Afolan & MCPA Banvel Blagai Dyvel Kil-Mor Lexone & Mixes Lorox & MCPA Mecoturf Sabre Sencor & Mixes Stampede CM Target Torch DS Tordon 202C Tropotox Plus	Afolan & MCPA Estaprop Lorox & MCPA	Bromox 720* Buctril M* 2,4-D* Dyvel Fusilade Estaprop Glean Hoe-Grass II Kil-Mor MCPA Pardner Sabre Sencor & Mixes Target Torch DS Tordon 202C Treflan	2,4-D* Estaprop*	
0*	Buctril M* Hoe-Grass II Pardner Sabre Torch DS	Afolan & MCPA Blagai Bromox 720 Buctril M 2,4-D Dyvel Estaprop Hoe-Grass II Lorox & MCPA MCPA Pardner Phenoxyline Plus Sabre Stampede CM Torch DS	Afolan & MCPA Blagai Bromox 720 Buctril M Cobutox 400 2,4-D Butyric 400 Dyvel Embutox E Estaprop Glean Heritage Hoe-Grass II Kil-Mor Lexone & Mixes Lorox & MCPA MCPA Pardner Phenoxyline Plus Sabre Sencor & Mixes Stampede CM Target Torch DS Tordon 202C Tropotox Plus	Afolan BW Avenge 200C Carbyne 2EC Hoe-Grass 284 Mataven	2,4-D Dyvel Kil-Mor Lorox & MCPA MCPA Target	Afolan & MCPA Blagai* Bromox 720 Buctril M Cobutox 400 2,4-D Butyric 400 Dyvel Embutox E Estaprop Kil-Mor Lexone & Mixes Lorox & MCPA MCPA Pardner Phenoxyline Plus Target Tropotox Plus	Afolan & MCPA Blagai* Bromox 720 Buctril M Cobutox 400 2,4-D Butyric 400 Dyvel Embutox E Estaprop Kil-Mor Lexone & Mixes Lorox & MCPA MCPA Pardner Phenoxyline Plus Sabre* (P) Target (A) Tordon 202C* Tropotox Plus	Afolan & MCPA (P-seedlings) Banvel* (P) Blagai* Bromox 720* (P) Buctril M* (P)	2,4-D* Dyvel* Embutox E* Estaprop* Kil-Mor* (A) Lorox & MCPA (A) MCPA* Lexone & Mixes Lorox & MCPA Mecoturf Sencor & Mixes Target	Banvel** 2,4-D* MCPA*	Afolan & MCPA Banvel Blagai Dyvel Kil-Mor Lexone & Mixes Lorox & MCPA Mecoturf Sencor & Mixes Target	Afolan & MCPA Banvel Blagai Dyvel Kil-Mor Lexone & Mixes Lorox & MCPA Mecoturf Sabre* Sencor (mixes) Target	Afolan & MCPA Banvel Blagai Dyvel Kil-Mor Lexone & Mixes Lorox & MCPA Mecoturf Sabre Sencor & Mixes Stampede CM Target Torch DS Tordon 202C Tropotox Plus	Afolan & MCPA Estaprop Lorox & MCPA	Bromox 720 Buctril M 2,4-D* Dyvel Estaprop Glean Hoe-Grass II Kil-Mor MCPA Pardner Sabre Sencor & Mixes Target Torch DS Tordon 202C Treflan	2,4-D* Estaprop**				
00*	Buctril M* Pardner Sabre Torch DS	Afolan & MCPA Blagai Bromox 720 Buctril M 2,4-D Dyvel Lorox & MCPA MCPA Pardner Phenoxyline Plus Sabre Stampede CM Torch DS	Afolan & MCPA Blagai Bromox 720 Buctril M Cobutox 400 2,4-D Butyric 400 Dyvel Embutox E Glean Kil-Mor Lexone & Mixes Lorox & MCPA MCPA Pardner Phenoxyline Plus Sabre Stampede CM Target Torch DS Tropotox Plus		Afolan & MCPA Dyvel Kil-Mor Lorox & MCPA MCPA Target	Afolan & MCPA Blagai* Bromox 720 Buctril M Cobutox 400 2,4-D Butyric 400 Dyvel Embutox E Kil-Mor Lexone & Mixes Lorox & MCPA MCPA Pardner Phenoxyline Plus Target Tropotox Plus	Afolan & MCPA Blagai* Bromox 720 Buctril M Cobutox 400 2,4-D Butyric 400 Dyvel Embutox E Kil-Mor Lexone & Mixes Lorox & MCPA MCPA Pardner Phenoxyline Plus Sabre* (P) Target (A) Tordon 202C* Tropotox Plus	Afolan & MCPA (P-seedlings) Banvel* (P) Blagai* Bromox 720* (P) Buctril M* (P)	2,4-D* Dyvel* Embutox E* Glean* Kil-Mor* (A) Lorox & MCPA (A) MCPA* Lexone & Mixes Lorox & MCPA Mecoturf Target	Banvel** MCPA*	Afolan & MCPA Banvel Blagai Dyvel Kil-Mor Lexone & Mixes Lorox & MCPA Mecoturf Target	Afolan & MCPA Banvel Blagai Dyvel Kil-Mor Lexone & Mixes Lorox & MCPA Mecoturf Sabre* Target* Tropotox Plus	Afolan & MCPA Banvel Blagai Dyvel Kil-Mor Lexone & Mixes Lorox & MCPA Mecoturf Sabre* Target* Tropotox Plus	Lorox & MCPA* Afolan & MCPA	Bromox 720 Buctril M Dyvel Glean Kil-Mor MCPA* Pardner Sabre Target* Torch DS Treflan	MCPA*				
	Regionell	Regionell	Bladex (ITC) Lontrel* Regionell!! Rival Sencor (ITC) Treflan	Benazolin (wild mustard) Bladex (ITC) Regionell!! Sencor (ITC) Spectrum	Avadex BW Carbyne 2EC Hoe-Grass 284 Poast Regionell!! Rival Spectrum Treflan	Regionell!! Rival Treflan	Bladex (ITC) Lontrel* Regionell!! Rival Sencor (ITC) Spectrum Treflan	Regionell!! Lontrel Regionell!!	Bladex (ITC) Regionell!! Spectrum	Regionell!! Sencor (ITC) Spectrum	Lontrel* Regionell!!	Regionell!!	Regionell!! Sencor (ITC) Spectrum	Regionell!! Lontrel* Regionell!!	Regionell!! Benazolin* Lontrel* Regionell!!	Regionell!! Rival Sencor (ITC) Spectrum Treflan	Regionell!! Poast Regionell!!			
	Pardner Sabre Torch DS	Bromox 720 Buctril M 2,4-D	Bromox 720 Buctril M 2,4-D	Bromox 720 Buctril M 2,4-D MCPA	Avenge 200C Hoe-Grass 284	2,4-D MCPA	Bromox 720 Buctril M 2,4-D MCPA	Bromox 720 Buctril M 2,4-D	Bromox 720 Buctril M 2,4-D	Bromox 720 Buctril M 2,4-D	Bromox 720* (P) Buctril M* (P)	Banvel* 2,4-D* MCPA*	Banvel	Bromox 720 Buctril M 2,4-D	2,4-D* MCPA* Pardner Torch DS	2,4-D* MCPA* Pardner Torch DS				

Crop Rotation and Management Guide																			
Crop	Pre-plant		Post-plant		In-crop		Harvest		Storage		Post-harvest		Residues		Soil Health		Fertilization		
	Pre-plant	Post-plant	Pre-plant	Post-plant	Pre-plant	Post-plant	Pre-plant	Post-plant	Pre-plant	Post-plant	Pre-plant	Post-plant	Pre-plant	Post-plant	Pre-plant	Post-plant	Pre-plant	Post-plant	
OATS	Cobutox 400* Embutox E* Kil-Mor* Target* Tropotox Plus	Buctril M MCPA* Phenoxylene Plus Sabre Stampede CM	Afolan & MCRA Banvel Blagai Bromox 720 Buctril M Cobutox 400 2,4-D Butyric 400 Dyvel Embutox E Kil-Mor Lorox & MCRA MCRA* Pardner Sabre Stampede CM Target Torch DS	Afolan & MCRA Banvel Blagai Bromox 720 Buctril M Cobutox 400 2,4-D Butyric 400 Dyvel Embutox E Kil-Mor Lorox & MCRA MCRA* Pardner Sabre Stampede CM Target Torch DS	Bromox 720 Buctril M Sabre Torch DS	Afolan & MCRA Banvel Blagai Glean Lorox & MCRA Mecoturf Phenoxylene Plus	Banvel Dyvel Glean Kil-Mor* Mecoturf* Pardner*	Afolan & MCRA Banvel Bromox 720 Buctril M Dyvel Glean Kil-Mor Lorox & MCRA Pardner Sabre Target Torch DS	Afolan & MCRA Amine (seedling) Cobutox 400* Mecoturf Phenoxylene Plus	Blagai Bromox 720 Buctril M Dyvel Glean Kil-Mor Lorox & MCRA MCRA Phenoxylene Plus Sabre Stampede CM Target	Afolan F & MCRA Amine Lorox & MCRA Sodium TCA	Afolan F & MCRA Bromox 720 Buctril M Lorox & MCRA Pardner Sabre Torch DS	Embutox E & MCRA	Afolan & MCRA Blagai Buctril M & MCRA Dyvel Glean Lorox & MCRA MCRA* MCRA-K64 Target Tropotox Plus	Pardner*	Afolan* Blagai* Cobutox 400* 2,4-D*	Buctril M Pardner Sabre Torch DS	Afolan & MCRA Bromox 720 Buctril M Dyvel Lorox & MCRA MCRA Pardner Phenoxylene Plus Sabre Stampede CM Torch DS	
RAPESEED (TTC - triazine tolerant canola)	Reglone!!	Reglone!!	Lontrel* Reglone!! Sencor (TTC) Spectrum Treflan*	Bladex (TTC) Lontrel Reglone!! Rival Spectrum Treflan	Lontrel Reglone!!	Bladex (TTC) Reglone!! Rival Sencor (TTC) Spectrum Treflan	Benazolin* Bladex (TTC) Lontrel* Rival Reglone!!	Reglone!!	Hoe-Grass 284 Poast Reglone!! Rival Spectrum Treflan	Reglone!!	Dalapon Hoe-Grass 284 Poast Reglone!! Rival Sodium TCA Spectrum Treflan	Dalapon Hoe-Grass 284 Poast Reglone!! Rival Sodium TCA Spectrum Treflan	Bladex (TTC) Reglone!! Sencor (TTC)	Lontrel Reglone!!	Reglone!! Sencor (TTC) Spectrum Treflan*	Reglone!! Sencor (TTC)	Reglone!!	Reglone!!	Bladex (TTC) Reglone!! Rival Spectrum Treflan
RYE (Spring Application)	2,4-D* MCRA* Tropotox Plus	Buctril M 2,4-D MCRA* Sabre	Banvel Bromox 720 Buctril M MCRA* Pardner Sabre Torch DS Tropotox Plus*	Banvel Buctril M MCRA* Pardner Sabre Torch DS Tropotox Plus*	Bromox 720 Buctril M Sabre Pardner Sabre Torch DS	Banvel	Banvel Bromox 720 Buctril M Pardner Sabre Torch DS	2,4-D*	Hoe-Grass 284	Bromox 720 Buctril M 2,4-D MCRA Sabre	Hoe-Grass 284 Spectrum	Hoe-Grass 284	Bromox 720 Buctril M Sabre Torch DS	Bromox 720 Buctril M MCRA* Sabre Tropotox Plus	2,4-D*	Pardner Sabre Torch DS	Bromox 720 Buctril M 2,4-D MCRA Pardner Sabre Torch DS		
FLAX	Basagran 2,4-D* Reglone!!	Asulox F* Buctril M 2,4-D MCRA* Phenoxylene Plus Reglone!! Sabre Stampede CM	Blagai Bromox 720 Buctril M Hoe-Grass II MCRA* Pardner Reglone!! Sabre Stampede CM Torch DS Treflan	Asulox F* Blagai Bromox 720 Buctril M Hoe-Grass II MCRA* Pardner Reglone!! Sabre Stampede CM Torch DS Treflan	Bromox 720 Buctril M Hoe-Grass II Pardner Reglone!! Sabre Stampede CM Torch DS Treflan	Basagran!! Blagai Eptam Phenoxylene Plus Reglone!! Rival Sabre Stampede CM Torch DS Treflan	Bromox 720 Buctril M Hoe-Grass II Pardner Reglone!! Rival Sabre Stampede CM Torch DS Treflan	2,4-D* Phenoxylene Plus Reglone!!	Fusilade Hoe-Grass II Hoe-Grass 284 Poast Reglone!! Rival Sabre Stampede CM	Blagai* Bromox 720 Buctril M 2,4-D MCRA Phenoxylene Plus Reglone!! Sabre Stampede CM	Asulox F* Dalapon Eptam Fusilade Hoe-Grass II Hoe-Grass 284 Poast Reglone!! Rival Sodium TCA Stampede CM Treflan	Asulox F* Dalapon Eptam Fusilade Hoe-Grass II Hoe-Grass 284 Poast Reglone!! Rival Sodium TCA Stampede CM Treflan	Basagran Bromox 720 Buctril M Eptam Fusilade Hoe-Grass II Hoe-Grass 284 Poast Reglone!! Rival Sodium TCA Stampede CM Treflan	Reglone!!	Blagai* Buctril M & MCRA MCRA* MCRA-K64 Reglone!!	Eptam* Reglone!!	Blagai* 2,4-D* Reglone!!	Buctril M Hoe-Grass II Pardner Reglone!! Sabre Torch DS	Bromox 720 Buctril M 2,4-D MCRA Pardner Sabre Torch DS
MUSTARD			Treflan*	Rival Treflan		Rival Treflan		Rival Treflan		Hoe-Grass 284 Rival Treflan	Hoe-Grass 284 Rival Treflan	Hoe-Grass 284 Rival Treflan		Treflan**			Rival Treflan		



CROP		HERBICIDE SELECTOR CHART - FORAGE CROPS														
		Absinth	BARLEY (Foxtail)	BINDWEED (Field)	BLUEBUR	BRUSH (Alder, Aspen, Choke Cherry, Pasture Sage, Silverberry, Western Snowberry, Wild Rose, Willow)	BUCKWHEAT (Wild)	CATCHFLY Night-Flowering	CHAMOMILE (Scentless)	CHICKWEED	DANDELION	FOXTAIL (Green)	GRASS (Barnyard)	GRASS (Quack)	GROUNDSEL (Common)	HAWK'S-B (Narrow-leaf)
Alfalfa (irr) under irrigation	Seedling		Eptam (ppi) Kerb	Cobutox 400* 2,4-D Butyric 400* Embutox E*	Asulox F@*	Mow	Asulox F@* Cobutox 400 2,4-D Butyric 400 Embutox E		Kerb Eptam (ppi)	Cobutox 400 2,4-D Butyric Embutox E*	Asulox F@* Kerb Dalapon@ Eptam (ppi) Fusilade@ Hoe-Grass 284@	Asulox F@* Kerb Dalapon@ Eptam (ppi) Fusilade@ Hoe-Grass 284@	Amitrol T (spot)@ Dalapon@ Fusilade@ Kerb	Embutox E*	Embux E 8	
	Established	Reglone!!	Kerb Princep Reglone!! Sinbar*	Reglone!!	Asulox F@* Princep Reglone!! Sinbar	Mow	Asulox F@* Princep Reglone!! Sinbar	Princep Simadex Sencor (irr) Reglone!!	Reglone!!	Kerb Sinbar Princep Reglone!! Sinbar	Reglone!! Sinbar*	Asulox F@* Princep Reglone!! Sinbar	Asulox F@* Princep Reglone!! Sinbar	Amitrol T Kerb Reglone!! Sinbar*	Princep Reglone!! Sencor (irr)	Embux E 8 (Fall) Reglone!!
Alsike Clover	Seedling			Cobutox 400* 2,4-D Butyric 400* Embutox E Tropotox Plus		Mow	Cobutox 400 2,4-D Butyric 400 Embutox E Tropotox Plus*			Cobutox 400 2,4-D Butyric Embutox E* Tropotox Plus*				Amitrol T (spot)@	Embux E* Tropotox Plus*	Embux E &
	Established					Mow								Amitrol T (spot)@		
Red Clover	Seedling			Tropotox Plus		Mow	Tropotox Plus*			Tropotox Plus*	Fusilade@ Hoegrass 284@	Fusilade @ Hoegrass 284@	Amitrol T (spot)@ Fusilade@	Tropotox Plus*		
	Established	Reglone!!	Reglone!!	Reglone!!	Reglone!!	Mow	Reglone!!	Reglone!!	Reglone!!	Reglone!!	Fusilade@ Reglone!!	Fusilade@ Reglone!!	Amitrol T (spot)@ Fusilade@ Reglone!!	Reglone!!	Reglone!!	
White Dutch Clover	Seedling			Cobutox 400* 2,4-D Butyric 400* Embutox E* Tropotox Plus		Mow	Cobutox 400 2,4-D Butyric 400 Embutox			Cobutox 400 2,4-D Butyric Embutox E*				Amitrol T (spot)@	Embux E* Tropotox Plus*	Embux E &
	Established	Reglone!!	Reglone!!	Reglone!!	Reglone!!	Mow	Reglone!!	Reglone!!	Reglone!!	Reglone!!	Reglone!!	Reglone!!	Reglone!!	Amitrol T (spot)@ Reglone!!	Reglone!!	Reglone!!
Sweet Clover	Seedling					Mow					Hoegrass 284@	Hoegrass 284@	Amitrol T (spot)@			
	Established					Mow								Amitrol T (spot)@		
Bird's-foot Trefoil	Seedling		Eptam (ppi) Kerb	Cobutox 400* 2,4-D Butyric 400* Embutox E*		Mow	Cobutox 400 2,4-D Butyric 400 Embutox		Eptam (ppi) Kerb	Cobutox 400* Embutox E* 2,4-D Butyric	Dalapon@ Eptam (ppi) Fusilade@ Kerb	Dalapon@ Eptam (ppi) Fusilade@ Kerb	Amitrol T (spot)@ Dalapon@ Fusilade@ Kerb	Embux E*	Embux E & M	
	Established	Reglone!!	Kerb Princep Reglone!!	Reglone!!	Princep Reglone!!	Mow	Princep Reglone!!	Princep Reglone!!	Reglone!!	Reglone!!	Dalapon@ Fusilade@ Kerb Princep Reglone!!	Dalapon@ Fusilade@ Kerb Princep Reglone!!	Amitrol T (spot)@ Dalapon@ Fusilade@ Kerb	Reglone!!	Reglone!!	Reglone!!
Sainfoin	Seedling					Mow								Amitrol T (spot)@		
	Established					Mow								Amitrol T (spot)@		
Brome grass	Seedling				Buctril M	Mow	Buctril M Pardner Torch Torch DS	Buctril M Pardner Torch Torch DS	Buctril M Pardner Torch Torch DS		Hoegrass 284@	Hoegrass 284@	Amitrol T (spot)@	Buctril M Pardner Torch Torch DS		
	Established	2,4-D* Mow & 2,4-D		2,4-D*	2,4-D	2,4-D* Mow	MCPA			2,4-D				Amitrol T (spot)@	2,4-D (Fall) Sowing)	

	GRASS (Quack)	GROUNDSEL (Common)	HAWK'S-BEARD (Narrow-Leaved)	KNAPWEED (Diffuse, Spotted)	LAMB'S- QUARTERS	LETTUCE (Blue)	MUSTARDS	OATS (Wild)	PIGWEED (Prostrate, Redroot Tumble)	SHEPHERD'S PURSE	SMARTWEEDS	SOW-THISTLE (Annual, Perennial)	SPURGE (Leafy)	STINKWEED	THISTLE (Canada)	TOADFLAX	
	Amitrol T (spot)@ Dalapon@ Fusilade@ Kerb	Embutox E*	Embutox E & MCPA		Cobutox 400 2,4-D Butyric 400 Embutox E Eptam (ppi)	Embutox E*	Asulox F* @ Cobutox 400 2,4-D Butyric 400 Embutox E	Asulox F@ Fusilade@ Avadex BW@ Avenge 200C@ 284@ Carbyne 2EC@ Kerb Eptam (ppi)	Cobutox 400 2,4-D Butyric 400 Embutox E Eptam (ppi)	Cobutox 400 2,4-D Butyric 400 Embutox E	Asulox F@ Cobutox 400 2,4-D Butyric 400 Embutox E	Amitrol T (spot)@ Cobutox 400*	Amitrol T (spot)@	Asulox F* @ Cobutox 400 2,4-D Butyric 400 Embutox E	Amitrol T (spot)@ Cobutox 400* 2,4-D Butyric 400* Embutox E*	Amitrol T (spot)@	
"	Amitrol T (spot)@ Kerb Reglone!! Sinbar'	Princip Reglone!! Sencor (irr)	Embutox E & MCPA (Fall Spraying)	Reglone!!!	Princip Reglone!! Sencor (irr) Sinbar	Princip Reglone!!	Asulox F@ Sinbar Princip Reglone!! Sencor (irr)	Asulox F@ Sinbar Fusilade@ Kerb Princip	Reglone!! Sencor (irr) Sinbar	Reglone!! Sinbar	Asulox F@ Sinbar Princip Reglone!! Sencor (irr)	Amitrol T (spot)@ Reglone!! Sinbar (annual)	Amitrol T (spot)@ Reglone!!	Asulox F* @ Sinbar Princip Reglone!! Sencor (irr)	Amitrol T (spot)@ Reglone!! Sencor (irr)	Amitrol T (spot)@ Reglone!!	
	Amitrol T (spot)@	Embutox E* Tropotox Plus*	Embutox E & MCPA		Cobutox 400 2,4-D Butyric 400 Embutox E Tropotox Plus	Embutox E* Tropotox Plus*	Cobutox 400 2,4-D Butyric 400 Embutox E Tropotox Plus	Avadex BW@ Carbyne 2EC@	Cobutox 400 2,4-D Butyric 400 Embutox E Tropotox Plus	Cobutox 400 2,4-D Butyric 400 Embutox E Tropotox Plus	Cobutox 400 2,4-D Butyric 400 Embutox E Tropotox Plus	Amitrol T (spot)@ Cobutox 400* Embutox E Tropotox Plus	Amitrol T (spot)@	Cobutox 400 2,4-D Butyric 400 Embutox E Tropotox Plus	Amitrol T (spot)@ Cobutox 400* 2,4-D Butyric 400* Embutox E* Tropotox Plus	Amitrol T (spot)@	
	Amitrol T (spot)@							Carbyne 2EC@					Amitrol T (spot)@	Amitrol T (spot)@	Amitrol T (spot)@	Amitrol T (spot)@	
	Amitrol T (spot)@ Fusilade@	Tropotox Plus*			Tropotox Plus	Tropotox Plus*	Tropotox Plus	Avadex BW@ Avenge 200C@ Carbyne 2EC@ Fusilade@ Hoe-Grass 284@ Mataven@	Tropotox Plus	Tropotox Plus	Tropotox Plus	Amitrol T (spot)@ Tropotox Plus	Amitrol T (spot)@	Tropotox Plus	Amitrol T (spot)@ Tropotox Plus	Amitrol T (spot)@ Tropotox Plus	Amitrol T (spot)@
	Amitrol T (spot)@ Fusilade@ Reglone!!	Reglone!!	Reglone!!	Reglone!!!	Reglone!!	Reglone!!	Reglone!!	Fusilade@ Reglone!!	Reglone!!	Reglone!!	Reglone!!	Amitrol T (spot)@ Reglone!!	Amitrol T (spot)@ Reglone!!	Reglone!!	Amitrol T (spot)@ Reglone!!	Amitrol T (spot)@ Reglone!!	
	Amitrol T (spot)@	Embutox E* Tropotox Plus*	Embutox E & MCPA		Cobutox 400 2,4-D Butyric 400 Embutox E Tropotox Plus	Embutox E*	Cobutox 400 2,4-D Butyric 400 Embutox E Tropotox Plus	Avadex BW@	Cobutox 400 2,4-D Butyric 400 Embutox E Tropotox Plus	Cobutox 400 2,4-D Butyric 400 Embutox E Tropotox Plus	Cobutox 400 2,4-D Butyric 400 Embutox E Tropotox Plus	Amitrol T (spot)@ Cobutox 400* Embutox E Tropotox Plus	Amitrol T (spot)@	Cobutox 400 2,4-D Butyric 400 Embutox E Tropotox Plus	Amitrol T (spot)@ Cobutox 400* 2,4-D Butyric 400* Embutox E* Tropotox Plus	Amitrol T (spot)@	
	Amitrol T (spot)@ Reglone!!	Reglone!!	Reglone!!!	Reglone!!!	Reglone!!	Reglone!!	Reglone!!	Reglone!!	Reglone!!	Reglone!!	Reglone!!	Amitrol T (spot)@ Reglone!!	Amitrol T (spot)@ Reglone!!	Reglone!!	Amitrol T (spot)@ Reglone!!	Amitrol T (spot)@ Reglone!!	
	Amitrol T (spot)@							Avadex BW@ Avenge 200C@ Carbyne 2EC@ Hoe-Grass 284@					Amitrol T (spot)@	Amitrol T (spot)@	Amitrol T (spot)@	Amitrol T (spot)@	
	Amitrol T (spot)@							Carbyne 2EC@					Amitrol T (spot)@	Amitrol T (spot)@	Amitrol T (spot)@	Amitrol T (spot)@	
	Amitrol T (spot)@ Dalapon@ Fusilade@ Kerb	Embutox E*	Embutox E & MCPA		Cobutox 400 2,4-D Butyric 400 Embutox E Eptam (ppi)	Embutox E*	Cobutox 400 2,4-D Butyric 400 Embutox E	Avadex BW@ Avenge 2EC@ Eptam (ppi) Fusilade@ Kerb Mataven@	Cobutox 400 2,4-D Butyric 400 Embutox E Eptam (ppi)	Cobutox 400 2,4-D Butyric 400 Embutox E	Cobutox 400 2,4-D Butyric 400 Embutox E	Amitrol T (spot)@ Cobutox 400* Embutox E	Amitrol T (spot)@	Cobutox 400 2,4-D Butyric 400 Embutox E	Amitrol T (spot)@ Cobutox 400* 2,4-D Butyric 400* Embutox E*	Amitrol T (spot)@	
	Amitrol T (spot)@ Reglone!! Dalapon@ Fusilade@ Kerb	Princip Reglone!!	Reglone!!!	Reglone!!!	Princip Reglone!!	Princip Reglone!!	Princip Reglone!!	Fusilade@ Kerb@ Princip Reglone!!	Princip Reglone!!	Princip Reglone!!	Princip Reglone!!	Amitrol T (spot)@ Reglone!!	Amitrol T (spot)@ Reglone!!	Princip Reglone!!	Amitrol T (spot)@ Reglone!!	Amitrol T (spot)@ Reglone!!	
	Amitrol T (spot)@							Mataven@					Amitrol T (spot)@	Amitrol T (spot)@		Amitrol T (spot)@	Amitrol T (spot)@
	Amitrol T (spot)@												Amitrol T (spot)@	Amitrol T (spot)@		Amitrol T (spot)@	Amitrol T (spot)@
	Amitrol T (spot)@	Buctril M Pardner Torch Torch DS			Buctril M Pardner Torch Torch DS		Buctril M Pardner Torch Torch DS	Buctril M Pardner Torch Torch DS	Buctril M Pardner Torch Torch DS	Buctril M Pardner Torch Torch DS	Buctril M Pardner Torch Torch DS	Buctril M* @	Buctril M*	Buctril M Pardner Torch Torch DS	Buctril M Pardner Torch Torch DS	Buctril M*	
	Amitrol T (spot)@		2,4-D (Fall Spraying)	2,4-D (seedling control only)*	2,4-D MCPA	2,4-D*	2,4-D		2,4-D	2,4-D MCPA		2,4-D	2,4-D (seedling control only)* MCPA*	2,4-D MCPA	2,4-D* MCPA	2,4-D* (high rate)	
	Amitrol T (spot)@	Buctril M			Buctril M		Buctril M	Buctril M Pardner Torch Torch DS	Buctril M Pardner Torch Torch DS	Buctril M Pardner Torch Torch DS	Buctril M Pardner Torch Torch DS	Buctril M	Buctril M	Buctril M	Buctril M		

	Established	Reglone!!	Princip Reglone!!	Reglone!!	Princip Reglone!!	Mow	Princip Reglone!!	Princip Reglone!!	Reglone!!	Princip Reglone!!	Reglone!!	Kerb Princip Reglone!!	Kerb Princip Reglone!!	Dalapon@ Fusilade@ Kerb	Princep Reglone!!	Re	
Sainfoin	Seedling					Mow									Amitrol T (spot)@		
	Established					Mow									Amitrol T (spot)@		
Brome grass	Seedling				Buctril M	Mow	Buctril M Pardner Torch Torch DS	Buctril M Pardner Torch Torch DS	Buctril M Pardner Torch Torch DS			Hoegrass 284@	Hoegrass 284@	Amitrol T (spot)@	Buctril M Pardner Torch Torch DS		
	Established	2,4-D* Mow & 2,4-D		2,4-D*	2,4-D	2,4-D* Mow	MCPA				2,4-D				Amitrol T (spot)@		2,4-D* Mow & 2,4-D
Crested Wheatgrass	Seedling				Buctril M	Mow	Buctril M Pardner Torch Torch DS	Pardner Torch Torch DS	Buctril M Pardner Torch Torch DS			Hoe-Grass 284@	Hoe-Grass 284@	Amitrol T (spot)@	Buctril M Pardner Torch Torch DS		
	Established	2,4-D* Mow & 2,4-D		2,4-D*	2,4-D	2,4-D* Mow					2,4-D				Amitrol T (spot)@		
Intermediate Wheatgrass	Seedling				Buctril M	Mow	Buctril M Pardner Torch Torch DS	Pardner Torch Torch DS	Buctril M Pardner Torch Torch DS			Hoegrass 284@	Hoegrass 284@	Amitrol T (spot)@	Buctril M Pardner Torch Torch DS		
	Established	2,4-D* Mow & 2,4-D		2,4-D*	2,4-D	2,4-D* Mow					2,4-D				Amitrol T (spot)@		
Seed Only	Seedling				Buctril M	Mow	Buctril M Pardner Torch Torch DS	Pardner Torch Torch DS	Buctril M Pardner Torch Torch DS			Hoegrass 284@	Hoegrass 284@	Amitrol T (spot)@	Buctril M Pardner Torch Torch DS		
	Established	2,4-D* Mow & 2,4-D		2,4-D*	2,4-D	2,4-D* Mow					2,4-D				Amitrol T (spot)@		
	Creeping Red Fescue	Seedling		Banvel*	Buctril M	Banvel@ Mow		Pardner Torch Torch DS	Banvel@ Buctril M Pardner Torch Torch DS			Hoe-Grass 284@	Hoe-Grass 284@	Amitrol T (spot)@	Buctril M Pardner Torch Torch DS		
	Established	Mow & 2,4-D		Banvel* Banvel & 2,4-D*	2,4-D	Banvel@ Banvel & 2,4-D Mow	Banvel@		Banvel@		2,4-D				Amitrol T (spot)@		
Russian Wild Rye	Seedling				Buctril M	Mow	Buctril M Pardner Torch Torch DS	Pardner Torch Torch DS	Buctril M Pardner Torch Torch DS			Hoe-Grass 284@	Hoe-Grass 284@	Amitrol T (spot)@	Buctril M Pardner Torch Torch DS		
	Established	Mow & 2,4-D		2,4-D*	2,4-D	2,4-D Mow					2,4-D				Amitrol T (spot)@		
Timothy	Seedling				Buctril M	Mow	Buctril M Pardner Torch Torch DS	Pardner Torch Torch DS	Buctril M Pardner Torch Torch DS					Amitrol T (spot)@	Buctril M Pardner Torch Torch DS		
	Established					Mow									Amitrol T (spot)@		
Hay and Grazing	With Legumes		Kerb	Cobutox 400* 2,4-D Butyric 400* Embutox E* Tropotox Plus		2,4-D Ester - Dormant Season	Cobutox 400 2,4-D Butyric 400 Embutox Tropotox Plus*			Kerb	Cobutox 400 2,4-D Butyric 400 Embutox E* Tropotox Plus*			Amitrol T (spot)@			
	No Legumes	Banvel* @ MCPA* Mow & 2,4-D@	Kerb	Banvel* @ Embutox E@ Cobutox 400* Tropotox 2,4-D* Plus 2,4-D Butyric 400*	Banvel@ 2,4-D MCPA	Banvel@ 2,4-D	Banvel* @ Cobutox 400 MCPA* 2,4-D* 2,4-D Butyric 400*	Banvel* @	Banvel* @	Kerb	Banvel Cobutox 400 Embutox E* Tropotox Plus 2,4-D@						



* Suppression only • Weeds controlled or suppressed based on preliminary research @ Grazing or feeding restrictions # Pre-crop emergence to weed seedlings !! Used as a crop desiccant	HERBICIDE SELECTOR CHART — OTHER CROPS									HEMP-NETTLE	KNOTWEED	Kochia	LAMB'S-QUARTERS	MUSTARDS	NIGHTSHADE	
	BUCKWHEAT (Tartary)	BUCKWHEAT (Wild)	CHICKWEED	COCKLEBUR	COCKLE (Cow)	DARNEL (Persian)	FOXTAIL (Green)	GOOSEFOOT	GRASS (Barnyard)							
<b>BEANS (Snap and Dry)</b> • Check label to ensure chosen chemical or mix is registered for use on the crop.		Gramoxone# Rival Treflan	Amiben Basagran@ Eptam Gramoxone# Patoran Rival Treflan	Basagran@ Gramoxone#	Gramoxone# Rival Treflan	Gramoxone# Hoe-Grass 284 Rival Treflan	Amiben Du.. Eptam Hoe-Grass 284 Gramoxone# Patoran Rival Treflan	Gramoxone#	Amiben Dual Eptam Gramoxone# Patoran Rival Treflan	Basagran Gramoxone# Patoran	Gramoxone#	Amiben Rival Treflan	Amiben Basagran Eptam Gramoxone# Patoran Rival Treflan	Amiben Basagran@ Eptam Gramoxone# Patoran Rival Treflan	Eptam Hoe-Grass Gramoxone# Rival Treflan	
<b>CANARY GRASS</b>	Banvel Bromox 720 Buctril M Pardner Sabre Torch DS	Banvel Bromox 720 Buctril M Pardner Sabre Torch DS	Bromox 720	Buctril M	Banvel Brominal M Torch DS	Bromox 720 Buctril M Pardner Sabre Torch DS			Bromox 720 Buctril M Pardner Sabre Torch DS	Buctril M & MCPA		Bromox 720 Buctril M Pardner Sabre Torch DS	Bromox 720 Buctril M Pardner Sabre Torch DS	Bromox 720 Buctril M Pardner Sabre Torch DS	Avenge Mataven	
<b>CARROTS AND PARSNIPS (c - carrots)</b>	Lorox L (c)	Afolan F Lorox L (c) Rival (c) Treflan (c)	Afolan F Amiben (c) Lorox L (c) Rival (c) Treflan (c)		Afolan F Lorox L (c) Rival (c)	Rival (c) Treflan (c)	Afolan F@ Amiben (c) Lorox L (c) Rival (c) Treflan (c)	Afolan F@ Lorox L (c)	Afolan F Amiben (c) Lorox L (c) Rival (c) Treflan (c)	Afolan F@ Lorox L (c)	Afolan F@ Lorox L (c)	Afolan F@ Lorox L (c)	Afolan F@ Lorox L (c)	Rival (c) Treflan (c)		
<b>CORN</b> • Check label to ensure chosen chemical or mix is registered for use on the crop. FC (Field Corn)	Banvel Kii-Mor Pardner Torch DS	Afolan F Atrazine Banvel Bladex Buctril M Cobutox 400 (FC) Embutox E (FC) Kil-Mor Lorox L Pardner Primextra Princep Simadex Torch DS	Afolan F Eradicane 8-E Laddok Lorox L (c) Princep Simadex	Basagran@ Buctril M 2,4-D Amine Embutox E (FC) Kil-Mor Laddok Pardner	Afolan F Banvel Buctril M 2,4-D Amine Kil-Mor Lorox L Pardner Torch DS	Afolan F@ 2,4-D Amine Banvel Buctril M Dual & Mixes Eradicane 8-E Lorox L Primextra Princep Simadex	Afolan F@ 2,4-D Amine Banvel Buctril M Dual & Mixes Eradicane 8-E Lorox L Primextra Princep Simadex	Afolan F@ 2,4-D Amine Banvel Buctril M Dual & Mixes Eradicane 8-E Lorox L Primextra Princep Simadex	Afolan F@ 2,4-D Amine Banvel Buctril M Dual & Mixes Eradicane 8-E Lorox L Primextra Princep Simadex	Buctril M Tropotox Plus (FC)	Afolan F@ Buctril M Tropotox Plus (FC)	Afolan F@ Buctril M Kil-Mor Lorox L Pardner Torch DS	Afolan F@ Buctril M Kil-Mor Lorox L Pardner Torch DS	Afolan F@ Buctril M Kil-Mor Lorox L Pardner Torch DS	Atrazine Basagran Bladex Eradicane Laddok	
<b>FABABEANS</b>	Sencor	Rival Treflan	Basagran@ Lexone Rival Sencor Treflan	Basagran@	Rival Treflan	Hoe-Grass 284 Rival Treflan	Hoe-Grass 284 Rival Treflan		Hoe-Grass 284 Rival Treflan	Basagran@ Sencor	Lexone Sencor	Rival Treflan		Basagran@ Lexone Rival Sencor Treflan	Basagran@ Lexone Rival Sencor	Carbyme 2 Hoe-Grass Rival Treflan
<b>LENTILS</b>	Sencor	Rival Treflan	Rival Sencor Treflan		Rival Treflan	Hoe-Grass 284 Rival Treflan	Hoe-Grass 284 Rival Treflan		Hoe-Grass 284 Rival Treflan	Sencor	Sencor	Rival Treflan		Rival Sencor Treflan	Sencor	Carbyme 2 Hoe-Grass Rival Treflan
<b>PEAS (Field and Processing)</b> Check label to ensure chosen chemical or mix is registered for use on the crop	Lexone MCPA* Amine & Salts Reglone!! Sencor	MCAPA* Amine & Salts Reglone!! Sencor	Basagran@ Lexone Phenoxylene Plus Rival Treflan	Basagran@ MCPA* Amine & Salts Phenoxylene Plus Reglone!! Rival Sencor Treflan	Reglone!! Rival Treflan	Basfapon@ Dalapon@ Hoe-Grass 284 Reglone!! Rival Treflan	Basfapon@ Dalapon@ Hoe-Grass 284 Reglone!! Rival Treflan	Basfapon@ MCPA* Amine & Salts Reglone!!	Basfapon@ Dalapon@ Hoe-Grass 284 Reglone!! Rival Treflan	Lexone MCPA* Amine & Salts Reglone!! Sencor	Reglone!! Rival Treflan	Phenoxylene Plus Reglone!!	Basagran@ Lexone MCPA* Amine & Salts Phenoxylene Plus Reglone!! Rival Sencor Treflan	Basagran@ Regionle!!	Avadex BW Basfapon Carbyne Dalapon Hoe-Grass Reglone!! Rival Sencor Treflan	
<b>POTATOES</b> WP (White Potatoes) TS (Table Stock Only)	Gramoxone# Reglone!! Sencor	Afolan F Gramoxone# Lorox L	Afolan F Eptam Gramoxone# Lorox L	Gramoxone# Phenoxylene Plus (TS)# Reglone!!	Gramoxone# Lorox L Reglone!!	Basfapon Fusilade Gramoxone#	Afolan F Basfapon@ Dual Eptam	Afolan F@ Basfapon@ Dual Eptam	Afolan F@ Basfapon@ Dual Eptam	Gramoxone# Lexone Rorox L	Afolan F@ Gramoxone# Lexone Rorox L	Afolan F@ Gramoxone# Lexone Rorox L	Afolan F@ Gramoxone# Lexone Rorox L	Eptam Gramoxone# Reglone!!	Basfapon Eptam Fusilade Gramoxone# Rorox L	

	MUSTARDS	NIGHTSHADE	OATS (Wild)	PIGWEED (Prostrate)	PIGWEED (Redroot)	PURSLANE	RADISH (Wild)	RAPESEED (Volunteer)	SMARTWEEDS	SOW-THISTLE (Annual, Perennial)	SPURRY (Corn)	STINKWEED	THISTLE (Canada)	THISTLE (Russian)	VOLUNTEER CEREALS				
	Amiben Basagran®@ Eptam Gramoxone®# Patoran	Basagran®@ Eptam Gramoxone®# Patoran	Eptam Hoe-Grass 284 Gramoxone®# Rival Treflan	Amiben Eptam Gramoxone®# Patoran Rival Treflan	Amiben Basagran®@ Eptam Gramoxone®# Patoran Rival Treflan	Basagran®@ Eptam Gramoxone®# Patoran Rival Treflan	Basagran®@ Gramoxone®#	Basagran®@ Gramoxone®#	Amiben Basagran®@ Patoran	Gramoxone®#	Basagran®@ Eptam Gramoxone®# Patoran	Amiben Basagran®@ Gramoxone®# Patoran	Basagran®@ Gramoxone®#	Basagran®@ Gramoxone®# Rival Treflan	Eptam Gramoxone®# Treflan				
	Bromox 720 Buctril M Pardner Sabre Torch DS		Avenge Mataven		Bromox 720 Buctril M Pardner Sabre Torch DS				Banvel Buctril M Pardner Sabre Torch DS	Banvel® Bromox 720 (P) Buctril M* (P) Sabre* (P)	Banvel	Bromox 720 Buctril M Pardner Sabre Torch DS	Banvel® Bromox 720* Buctril M* Sabre*	Bromox 720 Pardner Sabre Torch DS					
	Afolan F®@ Lorox L (c)		Rival (c) Treflan (c)	Afolan F®@ Amiben (c) Lorox L (c) Rival (c) Treflan (c)	Afolan F®@ Lorox L (c) Rival (c) Treflan (c)	Afolan F®@ Lorox L (c)			Afolan F Amiben (c) Lorox L (c)	Afolan F (seedling) Lorox L (c)(A)	Afolan F Lorox L (c) Treflan (c)	Afolan F Lorox L (c)	Lorox L (c)*	Rival (c) Treflan (c)					
ter C)	Afolan F Atrazine Basagran®@ Bladex Buctril M Cobutox 400 (FC) 2,4-D Amine & ester Embutox E (FC) Kil-Mor Laddox Lorox L Pardner Primextra Torch DS Tropotox Plus (FC)	Atrazine Basagran Bladex Eradicane Laddok	Atrazine Eradicane 8-E	Afolan F Atrazine Bladex 2,4-D Amine Eradicane 8-E Kil-Mor Lorox L Primextra	Afolan F Atrazine Bladex Basagran®@ Buctril M Cobutox 400 (FC) 2,4-D Amine @ Embutox E (FC) Eradicane 8-E Kil-Mor Laddox Lorox L Pardner Primextra Torch DS Tropotox Plus (FC)	Afolan F Atrazine Bladex Basagran®@ Buctril M Cobutox 400 (FC) 2,4-D Amine Eradicane 8-E Kil-Mor Laddox Lorox L Primextra Princip Simadex Tropotox Plus (FC)	Afolan F®@ Basagran®@ 2,4-D Amine® & Salts** Although not registered for this use, those products registered to control mustards might be expected to safely control volunteer rapeseed.	Basagran®@ 2,4-D Amine® & Salts** Although not registered for this use, those products registered to control mustards might be expected to safely control volunteer rapeseed.	Afolan F®@ Atrazine Banvel & Mixes Basagran®@ Bladex Buctril M Cobutox 400* (FC) Embutox E (FC) Kil-Mor Laddox Lorox L (A) Tropotox Plus (FC)	Afolan F®@ Atrazine Banvel & Mixes Basagran®@ Bladex Buctril M* (P) Cobutox 400* (FC) Embutox E (FC) Kil-Mor Laddox Lorox L (A) Tropotox Plus (FC)	Afolan F®@ Atrazine Banvel & Mixes Basagran®@ Bladex Buctril M* (P) Cobutox 400* (FC) Embutox E (FC) Kil-Mor Laddox Lorox L (A) Tropotox Plus (FC)	Amitrol T (spot) Banvel® Basagran®@ Eradicane 8-E 2,4-D Amine Embutox E (FC) Kil-Mor Laddox Lorox L Pardner Primextra Princip Simadex Torch DS Tropotox Plus (FC)	Amitrol T (spot) Banvel® Basagran®@ Buctril M Cobutox 400* (FC) 2,4-D Amine Embutox E (FC) Kil-Mor Laddox Lorox L* Tropotox Plus (FC)	Amitrol T (spot) Banvel® Basagran®@ Buctril M* 2,4-D* Embutox E (FC) Kil-Mor Laddox Lorox L* Tropotox Plus (FC)	Basagran®@ Buctril M 2,4-D Amine Kil-Mor Laddok Pardner Torch Torch DS	Atrazine Eradicane 8-E			
	Basagran®@ Lexone Sencor	Basagran®@	Carbyne 2EC Hoe-Grass 284 Rival Treflan	Rival Treflan	Basagran®@ Lexone Rival Sencor Treflan	Basagran®@ Rival Treflan	Basagran®@	Basagran®@ Lexone Sencor	Basagran®@ Lexone Sencor		Basagran®@ Lexone Sencor	Basagran®@ Lexone Sencor	Basagran®@ Rival Sencor Treflan	Treflan®					
	Sencor		Carbyne 2EC Hoe-Grass 284 Rival Treflan	Rival Treflan	Rival Sencor Treflan	Rival Treflan		Sencor	Sencor		Sencor	Sencor	Rival Sencor Treflan						
Salts Plus	Basagran®@ Lexone MCPA® Amine & Salts Phenoxylene Plus Reglone!!	Basagran®@ Reglone!!	Avadex BW Basfapon Carbyne Dalapon Hoe-Grass 284	MCPA® Amine & Salts** Reglone!!	Basagran MCPA® Amine & Salts Phenoxylene Plus Reglone!! Rival Treflan	Basagran®@ MCPA® Amine & Salts Phenoxylene Plus Reglone!! Rival Treflan	Basagran®@ MCPA® Amine & Salts Reglone!! Rival Treflan	Basagran®@ Lexone MCPA® Amine & Salts Phenoxylene Plus Reglone!! Sencor	Basagran®@ Lexone MCPA® Amine & Salts Phenoxylene Plus Reglone!! Sencor	Amitrol T (spot) MCPA® Amine & Salts Phenoxylene Plus (annual) Reglone!!	Basagran Lexone MCPA® Amine & Salts Phenoxylene Plus Reglone!! Sencor	Basagran®@ Lexone MCPA® Amine & Salts Phenoxylene Plus Reglone!! Sencor	Amitrol T (spot) Basagran®@ MCPA® Amine & Salts Phenoxylene Plus Reglone!! Tropox Tropotox Plus	Amitrol T (spot) Basagran®@ Reglone!! Rival Sencor Treflan	Reglone!! Treflan®				

LENTILS	Sencor	Rival Treflan	Rival Sencor Treflan		Rival Treflan	Hoe-Grass 284 Rival Treflan	Hoe-Grass 284 Rival Treflan	Hoe-Grass 284 Rival Treflan	Sencor	Sencor	Rival Treflan		Rival Sencor Treflan	Sencor	Check label to ensure chosen chemical or mix is registered for use on the crop		
<b>PEAS (Field and Processing)</b>	Lexone MCPA* Amine & Salts Region!! Sencor	MCPA* Amine & Salts Region!! Rival Treflan	Basagran@ Lexone Phenoxylene Plus Region!! Rival Sencor Treflan	Basagran@ MCPA* Amine & Salts Region!! Tropotox*	Reglone!! Rival Treflan	Basfapon@ Dalapon@ Hoe-Grass 284 Region!! Rival Treflan	MCPA* Amine & Salts Region!!	Basfapon@ Dalapon@ Hoe-Grass 284 Region!! Sodium TCA (field) Rival Treflan	Basagran@ Reglone!! Sencor	Lexone MCPA* Amine & Salts Region!! Sencor Tropotox Tropotox Plus	Reglone!! Rival Treflan Tropotox Plus	Phenoxylene Plus Region!!	Basagran@ Lexone MCPA* Amine & Salts Phenoxylene Plus Region!! Rival Sencor Treflan Tropotox Tropotox Plus	Sasagran@ Lexone MCPA* Amine & Salts Phenoxylene Plus Region!! Sencor Tropotox Tropotox Plus	Basagran@ Reglone!!		
<b>POTATOES</b> WP (White Potatoes) TS (Table Stock Only)	Gramoxone# Region!! Sencor	Afolan F Gramoxone# Lorox L Region!! Sencor*	Afolan F Eptam Gramoxone# Lorox L Patoran Phenoxylene Plus (TS)# Region!! Sencor	Gramoxone# Phenoxylene Plus (TS)# Region!!	Gramoxone# Lorox L Region!!	Basfapon Fusilade Gramoxone# Hoe-Grass 284 Region!!	Afolan F Basfapon@ Dual Eptam Fusilade Gramoxone# Hoe-Grass 284 Lexone* Lorox L Patoran Region!! Sencor	Afolan F@ Basfapon@ Dual Eptam Fusilade Gramoxone# Hoe-Grass 284 Lorox L Patoran Region!! Sencor	Afolan F@ Gramoxone# Lexone Lorox L Patoran Region!! Sencor	Afolan F@ Gramoxone# Lexone Lorox L Patoran Region!! Sencor*	Afolan F@ Gramoxone# Lexone Lorox L Patoran Phenoxylene Plus (TS)# Region!! Sencor*	Afolan F Eptam Gramoxone# Lorox L Patoran Phenoxylene Plus (TS)# Region!! Sencor	Afolan F Gramoxone# Lorox L Patoran Phenoxylene Plus (TS)# Region!! Sencor	Eptam Gramoxone# Region!!	Banana Eptam Fusilade Gramoxone# Lorox L Patoran Phenoxylene Plus (TS)# Region!! Sencor		
<b>RUTABAGAS</b>		Rival Treflan	Eptam Rival Treflan		Rival Treflan	Rival Treflan	Eptam Rival Treflan		Eptam Rival Treflan		Rival Treflan		Eptam Rival Treflan		Eptam Rival Treflan	Eptam Rival Treflan	
<b>SOYBEANS</b>	Reglone!!	Reglone!! Rival Treflan	Basagran@ Patoran Reglone!! Rival Treflan	Basagran@ Reglone!!	Reglone!! Rival Treflan	Hoe-Grass 284 Poast Rival Treflan	Hoe-Grass 284 Patoran Poast Reglone!! Rival Treflan	Reglone!!	Hoe-Grass 284 Patoran Poast Reglone!! Rival Treflan	Reglone!!	Reglone!! Rival Treflan	Patoran Reglone!!	Basagran@ Patoran Reglone!! Rival Treflan	Basagran@ Patoran Reglone!! Rival Treflan	Basagran@ Region!!	Hoe-Grass Poast Patoran Rival Treflan	
<b>SUNFLOWERS</b>	Reglone!!	Reglone!! Rival Treflan	Amiben & Treflan Eptam Reglone!! Rival Treflan	Reglone!!	Reglone!! Rival Treflan	Fusilade Hoe-Grass 284 Poast Rival Treflan	Amiben & Treflan Eptam Fusilade Hoe-Grass 284 Poast Reglone!! Rival Treflan	Reglone!!	Amiben & Treflan Eptam Fusilade Hoe-Grass 284 Poast Reglone!! Rival Treflan	Reglone!!	Amiben & Treflan Reglone!! Rival Treflan	Reglone!!	Amiben & Treflan Reglone!! Rival Treflan	Reglone!!	Amiben & Treflan Reglone!! Rival Treflan	Amiben & Treflan Eptam Reglone!! Rival Treflan	
<b>TAME BUCKWHEAT</b>						Basafapon Hoe-Grass 284	Basafapon Hoe-Grass 284		Basafapon Hoe-Grass 284								
<b>TRITICALE</b>	Hoe-Grass II Pardner Torch DS	Hoe-Grass II Pardner Torch DS			Hoe-Grass II Pardner Torch DS	Hoe-Grass II Hoe-Grass 284	Hoe-Grass II Hoe-Grass 284		Hoe-Grass II Hoe-Grass 284			Hoe-Grass II Pardner Torch DS	Hoe-Grass II Pardner Torch DS	Pardner Torch DS			Hoe-Grass II Hoe-Grass 284

	Sencor		Carbyne 2EC Hoe-Grass 284 Rival Treflan	Rival Treflan	Rival Sencor Treflan	Rival Treflan		Sencor	Sencor		Sencor	Sencor		Rival Sencor Treflan			
Salts	Basagran@ Lexone MCPA* Amine & Salts Phenoxylene Plus Reglone!! Sencor Tropotox Tropotox Plus	Basagran@ Reglone!!	Avadex BW Basfapon Carbyne Dalapon Hoe-Grass 284 Reglone!! Rival Treflan	MCPA* Amine & Salts** Reglone!! Rival Treflan	Basagran MCPA* Amine & Salts Phenoxylene Plus Reglone!! Rival Sencor Treflan Tropotox Tropotox Plus	Basagran@ MCPA* Amine & Salts Reglone!! Rival Treflan Tropotox Tropotox Plus	Basagran@ MCPA* Amine & Salts Reglone!! Rival Treflan	Basagran@ Lexone MCPA* Amine & Salts Phenoxylene Plus Reglone!! Sencor Tropotox Tropotox Plus	Amitrol T (spot) MCPA* Amine & Salts Phenoxylene Plus (annual) Reglone!! Sencor Tropotox Tropotox Plus	Basagran Lexone Reglone!! Sencor	Basagran@ Lexone MCPA* Amine & Salts Phenoxylene Plus Reglone!! Sencor Tropotox Tropotox Plus	Amitrol T (spot) MCPA* Amine & Salts Phenoxylene Plus Reglone!! Sencor Tropotox Tropotox Plus	Basagran@ Reglone!! Rival Sencor Treflan	Reglone!! Treflan*			
TS#	Afolan F Gramoxone# Lexone* Lorox L Patoran Phenoxylene Plus Reglone!! Sencor	Eptam Gramoxone# Reglone!!	Basfapon Eptam Fusilade Gramoxone# Hoe-Grass 284 Reglone!!	Afolan F Eptam Gramoxone# Lexone Lorox L Patoran Reglone!! Sencor*	Afolan F Eptam Gramoxone# Lexone Lorox L Patoran Phenoxylene Plus (TS)# Reglone!! Sencor	Afolan F Eptam Gramoxone# Lorox L Patoran Reglone!!	Gramoxone# Lexone Lorox L Patoran Reglone!! Sencor	Afolan F Gramoxone# Lexone Lorox L (A) Phenoxylene Plus (annual) Reglone!! Sencor	Afolan F (seeding) Gramoxone# Lorox L (A) Phenoxylene Plus (annual) Reglone!! Sencor	Afolan F Eptam Gramoxone# Lexone Lorox L Patoran Reglone!! Sencor	Afolan F Gramoxone# Lorox L* Reglone!! Sencor	Gramoxone# Lorox L* Reglone!! Sencor	Gramoxone# Lexone* Reglone!! Sencor	Eptam Fusilade Gramoxone# Lexone* Reglone!! Sencor*			
		Eptam	Eptam Rival Treflan	Eptam Rival Treflan	Eptam Rival Treflan	Eptam Rival Treflan				Eptam			Rival Treflan	Eptam			
	Basagran Patoran Reglone!!	Basagran@ Reglone!!	Hoe-Grass 284 Poast Reglone!! Rival Treflan	Patoran Reglone!! Rival Treflan	Basagran@ Patoran Reglone!! Rival Treflan	Basagran@ Patoran Reglone!! Rival Treflan	Basagran@ Reglone!!	Basagran@ Patoran Reglone!!	Amitrol T (spot) Reglone!!	Basagran@ Patoran Reglone!!	Basagran@ Patoran Reglone!!	Amitrol T (spot) Basagran@ Reglone!!	Basagran Reglone!! Rival Treflan	Poast Reglone!! Rival Treflan*			
an	Amiben & Treflan Reglone!!	Eptam Reglone!!	Amiben & Treflan Carbyne 2EC Eptam Fusilade Hoe-Grass 284 Poast Reglone!! Rival Treflan	Amiben & Treflan Eptam Reglone!! Rival Treflan	Amiben & Treflan Eptam Reglone!! Rival Treflan	Eptam Reglone!! Rival Treflan	Reglone!!	Reglone!!	Amiben & Treflan Reglone!!	Reglone!!	Eptam Reglone!!	Amiben & Treflan Reglone!!	Reglone!!	Reglone!! Rival Treflan	Eptam Fusilade Reglone!! Treflan*		
			Hoe-Grass 284														
	Pardner Torch DS		Hoe-Grass II Hoe-Grass 284 Mataven		Hoe-Grass II Pardner Torch DS			Hoe-Grass II Pardner Torch DS			Hoe-Grass II Pardner Torch DS		Hoe-Grass II Pardner Torch DS		Hoe-Grass II Pardner Torch DS		

NOTE: Insecticides Listed By:  
Active ingredient  
(Trade Name)

# INSECTICIDE SELECTOR CHART

CROPS	INSECTS	BEETLES						ARMED FORCES				BUTTERFLIES AND MOTHS			
		BLISTER BEETLES	COLORADO POTATO BEETLE	FLEA BEETLES	RED TURNIP BEETLE	WEEVILS (Sweet Clover, Alfalfa)	WIREWORMS	ALFALFA LOOPER	ARMYWORMS	*BERTHA ARMYWORM OR CLOVER CUTWORM	BEET WEBWORM	CUTWORMS (Army, Red-backed, Pale Western)	DIAMONDBACK MOTH LARVAE	EUR *CO	
BARLEY						Gamma BHC (Lindane)		Azinphos-Methyl (Guthion) Carbaryl (Sevin) Chlorpyrifos (Lorsban) Malathion Methomyl (Lannate, Nudrin) Methoxychlor Trichlorfon (Dylox)				Chlorpyrifos (Lorsban) Deltamethrin (Decis) Permethrin (Ambush)			
OATS						Gamma BHC (Lindane)		Azinphos-Methyl (Guthion) Carbaryl (Sevin) Chlorpyrifos (Lorsban) Malathion Methomyl (Lannate, Nudrin) Methoxychlor Trichlorfon (Dylox)				Chlorpyrifos (Lorsban) Deltamethrin (Decis) Permethrin (Ambush)			
RYE						Gamma BHC (Lindane)		Azinphos-Methyl (Guthion) Carbaryl (Sevin) Chlorpyrifos (Lorsban) Malathion Trichlorfon (Dylox)				Permethrin (Ambush)			
WHEAT						Gamma BHC (Lindane)		Azinphos-Methyl (Guthion) Carbaryl (Sevin) Chlorpyrifos (Lorsban) Malathion Methomyl (Lannate, Nudrin) Methoxychlor Trichlorfon (Dylox)				Chlorpyrifos (Lorsban) Deltamethrin (Decis) Permethrin (Ambush)			
CORN (FIELD)						Gamma BHC (Lindane)		Carbaryl (Sevin) Methomyl (Lannate, Nudrin) Methoxychlor Trichlorfon (Dylox)				Chlorpyrifos (Lorsban) Permethrin (Ambush)			
ALFALFA	Carbaryl (Sevin)		Methoxychlor		Azinphos-methyl (Guthion) Carbaryl (Sevin) Carbofuran (Furadan) Deltamethrin (Decis) Dimethoate (Cygon) Malathion Methidathion (Supracide) Methoxychlor			Methoxychlor Trichlorfon (Dylox)			Carbaryl (Sevin) Trichlorfon (Dylox)		Carbaryl Carbofuran Endosulfan Malathion *Corn Earworm Permethrin		
CLOVER	Carbaryl (Sevin)		Methoxychlor		Azinphos-methyl (Guthion) Carbaryl (Sevin) Dimethoate (Cygon) Malathion Methoxychlor			Carbaryl (Sevin) Methoxychlor			Carbaryl (Sevin)				
PASTURE															
CANOLA			Azinphos-methyl (Guthion) Carbaryl (Sevin) Carbofuran (Furadan) Deltamethrin (Decis) Gamma BHC (Lindane) Malathion Methidathion (Supracide) Terbufos (Counter)	Azinphos-methyl (Guthion) Carbofuran (Furadan) Methidathion (Supracide)			Chlorpyrifos (Lorsban) Methomyl (Lannate, Nudrin)	Chlorpyrifos (Lorsban)	Chlorpyrifos* (Lorsban*) Methamidophos* (Monitor*) Methomyl (Lannate, Nudrin) *Bertha Armyworm Only Deltamethrin (Decis)	Methomyl (Lannate, Nudrin) Trichlorfon (Dylox)	Chlorpyrifos (Lorsban) Permethrin (Ambush)	Azinphos-methyl (Guthion) Chlorpyrifos (Lorsban) Malathion Methidathion (Supracide) Trichlorfon (Dylox)			
FLAX								Trichlorfon (Dylox)	Methomyl (Lannate, Nudrin)	Trichlorfon (Dylox)	Chlorpyrifos (Lorsban) Deltamethrin (Decis) Permethrin (Ambush)		Chlorpyrifos (Lorsban) Malathion Methidathion (Supracide)		

NO MOTHS				FLIES		GRASSHOPPERS	PLANT BUGS	STORED GRAIN INSECTS	SUCKING INSECTS			THrips	
	DIAMONDBACK MOTH LARVAE	EUROPEAN CORN BORER OR *CORN EARWORM	FLAX BOLLWORM	THISTLE BUTTERFLY (Painted Lady)	BEET LEAFMINER	ROOT MAGGOTS (Corn, Sugar Beet)	(Clear-winged, migratory, two-striped)	ALFALFA, SUPERB, STINK, LYGUS, TARNISHED	FLOUR BEETLES, GRAIN BEETLES, MEDITERRANEAN FLOUR MOTH	APHIDS (Corn leaf, Green bug, Green Peach, English Grain, Pea)	LEAFHOPPERS (Potato)	SPITTLEBUGS	BARLEY, GRASS, RED CLOVER
							Azinphos-methyl (Guthion) Carbaryl (Sevin) Carbofuran (Furadan) Chlorpyrifos (Lorsban) Deltamethrin (Decis) Dimethoate (Cygon) Malathion		Malathion Phosphine (Gastoxin, Phostoxin)	Dimethoate (Cygon) Malathion			Dimethoate (Cygon) Malathion Methomyl (Lannate, Nudrin)
							Aziphos-methyl (Guthion) Carbaryl (Sevin) Carbofuran (Furadan) Chlorpyrifos (Lorsban) Deltamethrin (Decis) Dimethoate (Cygon) Malathion		Malathion Phosphine (Gastoxin, Phostoxin)	Dimethoate (Cygon) Malathion			Dimethoate (Cygon) Malathion Methomyl (Lannate, Nudrin)
							Azinphos-methyl (Guthion) Carbaryl (Sevin) Malathion		Malathion Phosphine (Gastoxin, Phostoxin)	Dimethoate (Cygon) Malathion			Dimethoate (Cygon) Malathion Methomyl (Lannate, Nudrin)
							Azinphos-methyl (Guthion) Carbaryl (Sevin) Carbofuran (Furadan) Chlorpyrifos (Lorsban) Deltamethrin (Decis) Dimethoate (Cygon) Malathion		Malathion Phosphine (Gastoxin, Phostoxin)	Dimethoate (Cygon) Malathion			Dimethoate (Cygon) Malathion Methomyl (Lannate, Nudrin)
	Carbaryl (Sevin) Carbofuran (Furadan) Endosulfan* (Thiodan) Malathion* *Corn Earworm Only Permethrin (Ambush)				Diazinon	Carbaryl (Sevin) Carbofuran (Furadan) Malathion		Malathion Phosphine (Gastoxin, Phostoxin)	Malathion Endosulfan (Thiodan)			Malathion	
							Azinphos-methyl (Guthion) Carbaryl (Sevin) Carbofuran (Furadan) Dimethoate (Cygon) Malathion Methoxychlor	Azinphos-methyl (Guthion) Deltamethrin (Decis) Dimethoate (Cygon) Endosulfan (Thiodan) Malathion Methidathion (Supracide) Trichlorfon (Dylox) (usually necessary to control in seed fields)		Azinphos-methyl (Guthion) Dimethoate (Cygon) Endosulfan (Thiodan) Malathion Methidathion (Supracide) Methoxychlor	Azinphos-methyl (Guthion) Carbaryl (Sevin) Dimethoate (Cygon) Malathion Methidathion (Supracide) Methoxychlor	Azinphos-methyl (Guthion) Endosulfan (Thiodan) Malathion	
							Azinphos-methyl (Guthion) Carbaryl (Sevin) Carbofuran (Furadan) Dimethoate (Cygon) Malathion Methoxychlor	Azinphos-methyl (Guthion) Dimethoate (Cygon) Malathion		Azinphos-methyl (Guthion) Dimethoate (Cygon) Malathion	Azinphos-methyl (Guthion) Carbaryl (Sevin) Dimethoate (Cygon) Malathion Methoxychlor	Azinphos-methyl (Guthion) Endosulfan (Thiodan) Malathion	
							Carbaryl (Sevin) Carbofuran (Furadan) Dimethoate (Cygon) Malathion	Dimethoate (Cygon)		Dimethoate (Cygon)	Dimethoate (Cygon)		
	Azinphos-methyl (Guthion) Chlorpyrifos (Lorsban) Malathion Methidathion (Supracide) Trichlorfon (Dylox)						Carbaryl (Sevin) Carbofuran (Furadan) Chlorpyrifos (Lorsban) Dimethoate (Cygon) Malathion Methamidophos (Monitor)			Dimethoate (Cygon)	Dimethoate (Cygon)		
				Methomyl (Lannate, Nudrin)			Carbofuran (Furadan) Deltamethrin (Decis) Malathion						
							Carbofuran (Furadan) Malathion						

<b>CANOLA</b>			Azinphos-methyl (Guthion) Carbaryl (Sevin) Carbofuran (Furadan) Deltamethrin (Decis) Gamma BHC (Lindane) Malathion Methidathion (Supracide) Terbufos (Counter)	Azinphos-methyl (Guthion) Carbofuran (Furadan) Methidathion (Supracide)				Chlorpyrifos (Lorsban) Methomyl (Lannate, Nudrin)	Chlorpyrifos (Lorsban)	Chlorpyrifos* (Lorsban*) Methamidophos* (Monitor*) Methomyl (Lannate, Nudrin) *Bertha Armyworm Only Deltamethrin (Decis)	Methomyl (Lannate, Nudrin) Trichlorfon (Dylox)	Chlorpyrifos (Lorsban) Permethrin (Ambush)	Azinphos-methyl (Guthion) Chlorpyrifos (Lorsban) Malathion Methidathion (Supracide) Trichlorfon (Dylox)
									Trichlorfon (Dylox)	Methomyl (Lannate, Nudrin)	Trichlorfon (Dylox)	Chlorpyrifos (Lorsban) Deltamethrin (Decis) Permethrin (Ambush)	
<b>FLAX</b>													
<b>MUSTARD</b>			Carbofuran (Furadan) Deltamethrin (Decis) Gamma BHC (Lindane) Malathion Methidathion (Supracide)									Chlorpyrifos (Lorsban)	Malathion Methidathion (Supracide)
<b>SUNFLOWER</b>													Chlorpyrifos (Lorsban) Permethrin (Ambush)
<b>SUGAR BEETS</b>			Azinphos-methyl (Guthion) Malathion				Gamma BHC (Lindane) Terbufos (Counter)		Trichlorfon (Dylox)		Endosulphon (Thiodan) Trichlorfon (Dylox)	Chlorpyrifos (Lorsban) Permethrin (Ambush)	
<b>POTATO</b>	Methoxychlor	Aldicarb (Temik) Azinphos-methyl (Guthion) Carbaryl (Sevin) Carbofuran (Furadan) Chlorpyrifos (Lorsban) Deltamethrin (Decis) Diazinon Endosulfan (Thiodan) Malathion Methamidophos (Monitor) Methidathion (Supracide) Methoxychlor Deltamethrin (Decis) Permethrin (Ambush) Thimet (Phorate)	Aldicarb (Temik) Carbofuran (Furadan) Chlorpyrifos (Lorsban) Diazinon Endosulfan (Thiodan) Methamidophos (Monitor) Methidathion (Supracide) Methomyl (Lannate, Nudrin) Permethrin (Ambush) Methoxychlor Deltamethrin (Decis) Permethrin (Ambush) Thimet (Phorate)			Fonofos (Dyfonate) *not included in manual Thimet (Phorate) (reduction only)						Chlorpyrifos (Lorsban)	
<b>SWEET CORN</b>							Gamma BHC (Lindane)		Carbaryl (Sevin) Methoxychlor Trichlorfon (Dylox)			Chlorpyrifos (Lorsban) Permethrin (Ambush)	Carb... Carb... Endo... Meth... Nud... Per... *Con...

						Malathion Methoxychlor	Methidathion (Supracide) Trichlorfon (Dylox) (usually necessary to control in seed fields)			Methidathion (Supracide)	Methidathion (Supracide) Methoxychlor		
						Azinphos-methyl (Guthion) Carbaryl (Sevin) Carbofuran (Furadan) Dimethoate (Cygon) Malathion Methoxychlor	Azinphos-methyl (Guthion) Dimethoate (Cygon) Malathion		Azinphos-methyl (Guthion) Dimethoate (Cygon) Malathion	Azinphos-methyl (Guthion) Carbaryl (Sevin) Dimethoate (Cygon) Malathion Methoxychlor	Azinphos-methyl (Guthion) Endosulfan (Thiodan) Malathion		
						Carbaryl (Sevin) Carbofuran (Furadan) Dimethoate (Cygon) Malathion	Dimethoate (Cygon)		Dimethoate (Cygon)	Dimethoate (Cygon)			
Pyrifos (Lorsban) Athrin (Ambush)	Azinphos-methyl (Guthion) Chlorpyrifos (Lorsban) Malathion Methidathion (Supracide) Trichlorfon (Dylox)					Carbaryl (Sevin) Carbofuran (Furadan) Chlorpyrifos (Lorsban) Dimethoate (Cygon) Malathion Methamidophos (Monitor)			Dimethoate (Cygon)	Dimethoate (Cygon)			
Pyrifos (Lorsban) Deltamethrin (Decis) Athrin (Ambush)			Methomyl (Lannate, Nudrin)			Carbofuran (Furadan) Deltamethrin (Decis) Malathion							
Pyrifos (Lorsban)	Malathion Methidathion (Supracide)					Carbofuran (Furadan) Malathion							
Pyrifos (Lorsban) Deltamethrin (Decis)				Methidathion (Supracide)									
Pyrifos (Lorsban) Athrin (Ambush)						Aldicarb (Temik) Carbofuran (Furadan) Terbufos (Counter)			Endosulfan (Thiodan)				
Pyrifos (Lorsban)						Dimethoate (Cygon)	Azinphos-methyl (Guthion) Carbofuran (Furadan) Chlorpyrifos (Lorsban) Deltamethrin (Decis) Endosulfan (Thiodan) Methidathion (Supracide) Permethrin (Ambush)		Azinphos-methyl (Guthion) Aldicarb (Temik) Carbofuran (Furadan) Deltamethrin (Decis) Diazinon Dimethoate (Cygon) Endosulfan (Thiodan) Malathion Methamidophos (Monitor) Methomyl (Lannate, Nudrin) Pirimicarb (Pirimor) Thimet (Phorate)	Azinphos-methyl (Guthion) Aldicarb (Temik) Carbofuran (Furadan) Deltamethrin (Decis) Diazinon Dimethoate (Cygon) Endosulfan (Thiodan) Malathion Methamidophos (Monitor) Methidathion (Supracide) Methomyl (Lannate, Nudrin) Methoxychlor Permethrin (Ambush) Thimet (Phorate)	Azinphos-methyl (Guthion)	Azinphos-methyl (Guthion)	
Pyrifos (Lorsban) Athrin (Ambush)	Carbaryl (Sevin) Carbofuran (Furadan) Endosulfan* (Thiodan) Methomyl (Lannate, Nudrin) Permethrin (Ambush) *Corn Earworm Only				Diazinon	Carbaryl (Sevin) Carbofuran (Furadan) Malathion			Endosulfan (Thiodan) Malathion Pirimicarb (Pirimor)			Malathion	



